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VOL. VI.

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ENCYCLOPÆDIA BRITANNICA.

D I A

Diamond.

DIAMOND, a genus of earths of the siliceous kind, called *Adamas Gemma* by the Latins, *Demant* by the Germans and Swedes, and *Diamant* by the French, is the hardest of all stones hitherto discovered; commonly clear or transparent; though this property may perhaps belong only to the crystals, and not to the rock from which they originate. When brought to Europe in its rough state, it is either in the form of roundish pebbles, with shining surfaces, or of octædral crystals; but though they generally appear in octædral forms, yet their crystals are frequently irregular, especially when the surface inclines to crystallize during the shooting of the whole crystal, and also when several of them unite in one group; in which case the one hinders the other from assuming a regular form. Mr Magellan, however, informs us, that diamonds sometimes assume other forms. He has seen a rough diamond in its native state, of a regular cubical form, with its angles truncated or cut off; likewise another belonging to Dr Combe of London, whose square sides were naturally joined by two very narrow long facets, forming angles of about 120 degrees; and the corners were quite perfect.

Though the diamond is commonly clear and pellucid, yet some of them are met with of a rose colour, or inclining to green, blue, or black, and some have black specks. Tavernier saw one in the treasury of the Mogul, with black specks in it, weighing about 56 carats; and he informs us, that yellow and black diamonds are produced in the mines at Carnatica. Mr Dutens also relates, that he saw a black diamond at Vienna in the collection of the prince de Lichtenstein. Some diamonds have a greenish crust; and of these M. Tavernier relates, that they burst into pieces while working into a proper shape, or in the very act of polishing on the wheel. In confirmation of this, he mentions a large diamond worth upwards of 5000 l. Sterling, which burst into nine pieces while polishing on the wheel at Venice.

The finest diamonds are those of a complexion like that of a drop of pure water. It is likewise a valuable property if they are of a regular form and truly made; as also that they be free from stains, spots, specks, flaws, and cross veins. If diamonds are tintured yellow, blue, green, or red, in a high degree, they are next in esteem; but if they are tintured with these colours only in a low degree, the value of them is greatly diminished. There are also diamonds of other complexions; such as brown, and those of a dark hue: the first resembling the brownest sugar-candy, and the latter dusky iron. In the *Philosophical Commerce of Arts*, Dr Lewis tells us of a black diamond that he himself had seen. At a distance, it looked uniformly

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black; but on closer examination appeared in some parts transparent, and in others charged with foulness, on which the black hue depended.

These gems are lamellated, consisting of very thin plates like those of talc, but very closely united; the direction of which must be found out by lapidaries before they can work them properly: Such as have their foliated substance not in a flat position, are called by the workmen *diamonds of nature*.

The names of *oriental* and *occidental*, given by jewellers to this and all other precious stones, have a different meaning from the obvious sense; the finest and hardest being always called *oriental*, whether they be produced in the east or not. Those called *occidental* are of inferior value; but according to Mr Jefferies, who has written a treatise on the subject, the diamonds of Brasil equal the finest oriental ones. The art of cutting these gems was invented in 1476 by Louis de Berquen a native of Bruges in the Austrian Netherlands. This stone becomes luminous in the dark, by exposure during a certain time to the rays of the sun; by heating it in a crucible; by plunging it in boiling water; or by rubbing it with a piece of glass. By friction it acquires an electrical property, by which it attracts the substance used for soils called *black mastic*, and other light matters. The author of the Chemical Dictionary says, that diamonds are refractory in the fire, and even apyrous. Nevertheless, experiments have been made, which prove that diamonds are capable of being dissipated, not only by the collected heat of the sun, but also by the heat of a furnace. Mr Boyle says, that he perceived certain acrid and penetrating exhalations from diamonds exposed to fire. A diamond by exposure to a concave speculum, the diameter of which was 40 inches, was reduced to an eighth part of its weight *. In the *Giornale de Letterati d' Italia*, tom. viii. art. 9. we may read a relation of experiments made on precious stones, by order of the grand duke of Tuscany, with a burning lens, the diameter of which was two thirds of a Florentine ell, near the focus of which was placed another smaller lens. By these experiments we find, that diamonds were more altered by solar heat than most of the other precious stones, although not the least appearance of a commencing fusion was observable. A diamond weighing 30 grains, thus exposed during 30 seconds, lost its colour, lustre, and transparency, and became of an opaque white. In five minutes, bubbles appeared on its surface; soon afterwards it burst into pieces, which were dissipated; and the small fragment which remained was capable of being crushed into fine powder by the pressure of the blade of a knife. Neither the addition of glass, flints, sulphur, metals, or salt of tartar, prevented this diffi-

* *Philos. Transac.*
no 386.

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pation of diamonds, or occasioned any degree of fusion. By this heat rubies were softened, and lost some of their colour, but preserved their form and weight. By addition of a third lens, a further degree of fusion was given to rubies. Even then rubies could not be made to unite with glass. By having been exposed to this heat, the surface of the rubies which had suffered fusion, lost much of their original hardness, and were nearly as soft as crystal. But their internal parts, which had not been fused, retained their hardness. Emeralds by this heat were rendered white, or of various colours, and soon afterwards were fused. They were found to have lost part of their weight, and to be rendered less hard and brittle.

Experiments were also made by order of the emperor Francis I. on precious stones; from which we find, that diamonds were entirely dissipated by having been exposed in crucibles to a violent fire of a furnace during 24 hours; while rubies by the same heat were not altered in weight, colour, or polish. By exposing diamonds during two hours only at a time, the following alterations produced on them by fire were observed. First, they lost their polish; then they were split into thin plates; and, lastly, totally dissipated. By the same fire, emeralds were fused. See *Magasin de Hambourg*, tom. xviii.

The action of fire on diamonds has, notwithstanding the above mentioned experiments, been lately doubted in France; and the question has been agitated by several eminent chemists with much interest, and numerous experiments have been made which throw some light on the subject. M. D'Arcet found, not only that diamonds included in porcelain crucibles close, or covered with perforated lids, and exposed to the long and intense heat of a porcelain furnace, were perfectly dissipated; but also, that these stones could in a few hours be totally volatilized with a much inferior degree of heat, by exposing them in a coppel, under the muffle of an essay-furnace. In this latter experiment, he observed that the dissipation was gradual, and that it was effected by a kind of exfoliation. The dissipation of diamonds exposed in coppels was confirmed by M. Macquer; who further observed, that the diamonds were, before the dissipation began, rendered, by the fire, brilliant and shining, as it were, with a phosphoric light. In order to determine whether the dissipation of diamonds was actually effected by their reduction into vapour, or by a combustion or other effect of air upon them, Messrs Lavoisier, Macquer, and Cadet, exposed diamonds to intense heat in an earthen retort, during several hours, but without any other effect than that their polish was destroyed, and about $\frac{1}{4}$ th of their weight diminished. M. Mitouard put diamonds in a tobacco-pipe filled with pounded charcoal and accurately closed with lute. He further secured the diamonds from access of air or flame, by placing the tobacco-pipe in a crucible, to which another crucible was inverted and carefully luted. The diamonds, thus secluded from external air, having been exposed to the most intense heat which could be excited in a well constructed furnace, were not thereby altered or diminished. M. Mitouard was induced to believe, that the charcoal conducted to the preservation of diamonds not merely by excluding the air, but by some peculiar property, which he supposes may be the same as that by

which this substance defends metals from destruction by fire. He was confirmed in his opinion, by observing that diamonds were not preserved from the action of fire by surrounding them with powder of chalk and of calcined hartshorn, and including them in close vessels, so well as when the charcoal had been employed. Some chemists even thought that the perfect exclusion of air alone was sufficient to preserve diamonds, and doubted whether the balls and crucibles of porcelain employed by M. D'Arcet had excluded the air with sufficient accuracy. Indeed, in one of M. D'Arcet's own experiments, a diamond included in a ball of porcelain had resisted the action of fire. In order to ascertain this question, M. Cadet exposed diamonds in covered and luted crucibles to the violent heat of a forge during two hours; by which operation the diamonds lost only $\frac{1}{4}$ th part of their weight. He infers, that the destruction of diamonds by fire in open vessels is not a true volatilization; but merely an exfoliation, caused by the fire expanding the air contained between the thin plates of which these stones consist, and that by this exfoliation or decrepitation these plates are reduced to so fine a powder as to escape observation. M. D'Arcet objected against the experiments of his adversaries, that they were not of sufficient duration to decide against his, which had lasted several days. He renewed and multiplied his experiments, which confirmed him in his opinion of the volatilization of diamonds in vessels perfectly closed; and that this effect of fire on diamonds is not a mere exfoliation or mechanical separation of the plates of which these stones consist, he infers from the parts of the diamonds pervading the most solid porcelain crucibles without being perceptible, and from the luminous appearance first noticed by M. Macquer, and which was afterwards observed by M. Roux to be an actual flame.

Diamonds are found only in the East Indies, and in Brasil in South America. The diamond mines are found only in the kingdoms of Golconda, Visapour, Bengal, and the island of Borneo. There are four mines, or rather two mines and two rivers, whence diamonds are drawn. The mines are, 1. That of Raolconda, in the province of Carnatica, five days journey from Golconda, and eight from Visapour. It has been discovered about 200 years. 2. That of Gani, or Coulour, seven days journey from Golconda easterly. It was discovered 140 years ago by a peasant, who digging in the ground found a natural fragment of 25 carats. 3. That of Soumelpour, a large town in the kingdom of Bengal, near the Diamond-mine. This is the most ancient of them all: it should rather be called that of *Gonal*, which is the name of the river, in the sand whereof these stones are found. Lastly, the fourth mine, or rather the second river, is that of Succudan, in the island of Borneo.

DIAMOND-Mine of Raolconda.—In the neighbourhood of this mine the earth is sandy, and full of rocks and copse. In these rocks are found several little veins of half and sometimes a whole inch broad, out of which the miners, with a kind of hooked irons, draw the sand or earth wherein the diamonds are; breaking the rocks when the vein terminates, that the track may be found again, and continued. When a sufficient quantity of earth or sand is drawn forth, they wash it two or three times, to separate the stones therefrom.

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Diamond. from. The miners work quite naked, except for a thin linen cloth before them; and besides this precaution, have likewise inspectors, to prevent their concealing of stones: which, however, maugre all this care, they frequently find means to do, by watching opportunities when they are not observed, and swallow-
Diamond. ing them down.

Diamond-Mine of Gani or Coulour.—In this mine are found a great number of stones from 10 to 40 carats, and even more; and it was here that famous diamond of Aureng-Zeb the Great Mogul, which before it was cut weighed 793 carats, was found. The stones of this mine are not very clear; their water is usually tinged with the quality of the soil; being black where that is marthy, red where it partakes of red, sometimes green and yellow, if the ground happen to be of those colours. Another defect of some consequence is a kind of greasiness appearing on the diamond, when cut, which takes off part of its lustre.—There are usually no less than 60,000 persons, men, women, and children, at work in this mine.

When the miners have found a place where they intend to dig, they level another somewhat bigger in the neighbourhood thereof, and inclose it with walls about two feet high, only leaving apertures from space to space, to give passage to the water. After a few superstitious ceremonies, and a kind of feast which the master of the mine makes for the workmen, to encourage them, every one goes to his business, the men digging the earth in the place first discovered, and the women and children carrying it off into the other walled round. They dig 12 or 14 feet deep, and till such time as they find water. Then they cease digging; and the water thus found serves to wash the earth two or three times, after which it is let out at an aperture reserved for that end. This earth being well washed, and well dried, they sift it in a kind of open sieve, or riddle, much as we do corn in Europe; then thrash it, and sift it afresh; and lastly, search it well with the hands to find the diamonds. They work naked as in the mine of Raoledona, and are watched after the like manner by inspectors.

Diamond-Mine of Soumelpour, or river Goual.—Soumelpour is a large town built all of earth, and covered with branches of cacao-trees: the river Goual runs by the foot thereof, in its passing from the high mountains towards the south to the Ganges, where it loses its name. It is from this river that all our fine diamond points, or sparks, called *natural sparks*, are brought. They never begin to seek for diamonds in this river till after the great rains are over, that is, after the month of December; and they usually even wait till the water is grown clear, which is not before January. The season at hand, eight or ten thousand persons, of all ages and sexes, come out of Soumelpour and the neighbouring villages. The most experienced among them search and examine the sand of the river, going up it from Soumelpour to the very mountain whence it springs. A great sign that there are diamonds in it, is the finding of those stones which the Europeans call *thunder-stones*. When all the sand of the river, which at that time is very low, has been well examined, they proceed to take up that wherein they judge diamonds likely to be found; which is done after the following manner: They dam the place

round with stones, earth, and fascines, and lading out the water, dig about two feet deep: the sand thus got is carried into a place walled round on the bank of the river. The rest is performed after the same manner as at Coulour, and the workmen are watched with equal strictness.

Diamond-Mine in the island of Borneo, or river of Succudan.—We are but little acquainted with this mine; the queen who reigns in that part of the island not allowing strangers to have any commerce in these stones: though there are very fine ones to be bought at Batavia, brought thither by stealth. They were anciently imagined to be softer than those of the other mines; but experience shows they are in no respect inferior to them.

Beside these four diamond-mines, there have been two others discovered; one of them between Coulour and Raoledona, and the other in the province of Carnatica; but they were both closed up almost as soon as discovered: that of Carnatica, because the water of the diamonds was always either black or yellow; and the other, on account of their cracking, and flying in pieces when cut and ground.

The diamond, we have already observed, is the hardest of all precious stones. It can only be cut and ground by itself and its own substance. To bring it to that perfection which augments its price so considerably, they begin by rubbing several against each other, while rough; after having first glued them to the ends of two wooden blocks, thick enough to be held in the hand. It is this powder thus rubbed off the stones, and received in a little box for the purpose, that serves to grind and polish the stones.

Diamonds are cut and polished by means of a mill, which turns a wheel of soft iron sprinkled over with diamond-dust mixed with oil of olives. The same dust, well ground, and diluted with water and vinegar, is used in the sawing of diamonds; which is performed with an iron or brass wire, as fine as a hair. Sometimes, in lieu of sawing the diamonds, they cleave them, especially if there be any large flivers therein. But the Europeans are not usually daring or expert enough to run the risk of cleaving, for fear of breaking.

The *first water* in diamonds means the greatest purity and perfection of their complexion, which ought to be that of the purest water. When diamonds fall short of this perfection, they are said to be of the *second* or *third water*, &c. till the stone may be properly called a *coloured one*: for it would be an impropriety to speak of an imperfectly coloured diamond, or one that has other defects, as a stone of a bad water only.

Mr Boyle has observed, from a person much conversant in diamonds, that some of these gems, in their rough state, were much heavier than others of the same bigness, especially if they were cloudy or foul; and Mr Boyle mentions one that weighed $8\frac{1}{2}$ grains, which being carefully weighed in water, proved to an equal bulk of that liquor as $2\frac{1}{2}$ to 1. So that, as far as could be judged by that experiment, a diamond weighs not thrice as much as water: and yet, in his table of specific gravities, that of a diamond is said to be to water as 3400 to 1000; that is, as $3\frac{1}{2}$ to 1; and therefore, according to these two accounts, there should be some diamonds whose specific gravity differs nearly $\frac{1}{4}$ from that of others. But this is a much greater dif-

Diamond. ference than can be expected in two bodies of the same species; and indeed, on an accurate trial, does not prove to be the case with diamonds. The Brazil diamonds differ a little in weight one from another, and greatly vary from the standard set by Mr Boyle for the specific gravity of this gem in general; two large diamonds from that part of the world being carefully weighed, one was found as 3518, the other as 3521, the specific gravity of water being reckoned 1000. After this, ten East India diamonds were chosen out of a large parcel, each as different from the other in shape, colour, &c. as could be found. These being weighed in the same scales and water with the former, the lightest proved as 3512, the heaviest as 3525, still supposing the water to be 1000.—Mr Elliott, who made these experiments, has drawn out a table of their several differences, which is done with great care and accuracy: and, taking in all the common varieties in diamonds, may serve as a general rule for their mean gravity and differences.

Water	In air.		Specific gravity 1000
	Grains.	Grains.	
No 1. A Brazil diamond, fine water and rough coat	92,425	66,16	3518
2. Ditto, fine water, rough coat	88,21	63,16	3521
3. Ditto, fine bright coat	10,025	7,170	3511
4. Ditto, fine bright coat	9,560	6,830	3501
5. An East India diamond, pale blue	26,485	18,945	3512
6. Ditto, bright yellow	23,33	16,710	3524
7. Ditto, very fine water, bright coat	20,66	14,800	3525
8. Ditto, very bad water, honeycomb coat	20,38	14,590	3519
9. Ditto, very hard bluish cast	22,5	16,1	3515
10. Ditto, very soft, good water	22,615	16,2	3525
11. Ditto, a very large red foulness in it	25,480	18,230	3514
12. Ditto, soft, bad water	29,525	21,140	3521
13. Ditto, soft, brown coat	26,535	18,990	3516
14. Ditto, very deep green coat	25,250	18,080	3521

The mean specific gravity of the Brazil diamonds appears to be 3513
Of the East India diamonds - - - 3519
The mean of both - - - 3517

Therefore if any thing is to be concluded as to the specific gravity of the diamond, it is, that it is to water as 3517 to 1000.

For the valuation of diamonds of all weights, Mr Jefferies lays down the following rule. He first supposes the value of a rough diamond to be settled at 21. per carat, at a medium; then to find the value of diamonds of greater weights, multiply the square of their weight by 2, and the product is the value required. *E. G.* to find the value of a rough diamond of two carats; $2 \times 2 = 4$, the square of the weight; which, multiplied by two, gives 81. the true value of a rough diamond of two carats. For finding the value of manufactured diamonds, he supposes half their weight to be lost in manufacturing them; and therefore, to find their

value, we must multiply the square of double their weight by 2, which will give their true value in pounds. Thus, to find the value of a wrought diamond weighing two carats; we first find the square of double the weight, viz $4 \times 4 = 16$; then $16 \times 2 = 32$. So that the true value of a wrought diamond of two carats is 321. On these principles Mr Jefferies has constructed tables of the price of diamonds from 1 to 100 carats.

The greatest diamond ever known in the world is one belonging to the king of Portugal, which was found in Brazil. It is still uncut: and Mr Magellan informs us, that it was of a larger size; but a piece was cleaved or broken off by the ignorant countryman, who chanced to find this great gem, and tried its hardness by the stroke of a large hammer upon the anvil.

This prodigious diamond weighs 1680 carats: and although it is uncut, Mr Romé de l'Isle says, that it is valued at 224 millions sterling; which gives the estimation of 79,36 or about 80 pounds sterling for each carat: viz. for the multiplicand of the square of its whole weight. But even in case of any error of the prefs in this valuation, if we employ the general rule above mentioned, this great gem must be worth at least 5,644,800 pounds sterling, which are the product of 1680 by two pounds, viz. much above five millions and a half sterling.

The famous diamond which adorns the sceptre of the Empress of Russia under the eagle at the top of it weighs 779 carats, and is worth at least 4,854,728 pounds sterling, although it hardly cost 135,417 guineas. This diamond was one of the eyes of a Malabar idol, named *Scheringham*. A French grenadier, who had deserted from the Indian service, contrived so well as to become one of the priests of that idol, from which he had the opportunity to steal its eye; he ran away to the English at Trichinapetty, and thence to Madras. A ship-captain bought it for twenty thousand rupees: afterwards a Jew gave seventeen or eighteen thousand pounds sterling for it: at last a Greek merchant, named *Gregory Suffras*, offered it to sale at Amsterdam in the year 1766: and the late prince Orloff made this acquisition, as he himself told Mr Magellan in London, for his sovereign the empress of Russia. Dutens, page 19. and Bonare, page 389. of his *Mineralogy*, relate the above anecdote. The figure and size of this diamond may be seen in the British Museum in London: it is far from being of a regular form.

The diamond of the great Mogul is cut in Rose; weighs 279,½ carats, and it is worth 380,000 guineas. This diamond has a small flaw underneath near the bottom: and Tavernier, page 389. who examined it, valued the carat at 150 French livres. Before this diamond was cut, it weighed 793½ carats, according to Romé de l'Isle: but Tavernier, page 339. of his second volume, says, that it weighed 900 carats before it was cut. If this is the very same diamond, its loss by being cut was very extraordinary.

Another diamond of the king of Portugal, which weighs 215 carats, is extremely fine, and is worth at least 369,800 guineas.

The diamond of the grand duke of Tuscany, now of the emperor of Germany, weighs 139½ carats; and is worth at least 109,520 guineas. Tavernier says, that

Diamond. that this diamond has a little hue of a citron colour; and he valued it at 135 *livres tournois* the carat. Robert de Berquen says, that this diamond was cut into two: that the grand Turk had another of the same size: and that there were at Bijnagar two large diamonds, one of 250 and another of 140 carats. This Robert de Berquen was the grandson of Louis de Berquen, who invented the art of cutting diamonds.

The diamond of the king of France, called the *Pitt* or *Regent*, weighs $136\frac{1}{2}$ carats: this gem is worth at least 208,333 guineas, although it did not cost above the half of this value.

The other diamond of the same monarch, called the *Sancy*, weighs 55 carats: it cost 25,000 guineas: and Mr Dutens says, that it is worth much above that price.

Brilliant DIAMOND, is that cut in faces both at top and bottom; and whose table, or principal face at top, is flat. To make a complete square brilliant, if the rough diamond be not found of a square figure, it must be made so; and if the work is perfectly executed, the length of the axis will be equal to the side of the square base of the pyramid.—Jewellers then form the table and collet by dividing the block, or length of the axis, into 18 parts. They take $\frac{1}{3}$ from the upper part, and $\frac{1}{3}$ from the lower. This gives a plane at $\frac{1}{3}$ distance from the girdle for the table; and a smaller plane at $\frac{1}{3}$ distance for the collet; the breadth of which will be $\frac{2}{3}$ of the breadth of the table. In this state the stone is said to be a *complete square table diamond*.—The brilliant is an improvement on the table-diamond, and was introduced within the last century, according to Mr Jefferies.—To render a brilliant perfect, each corner of the above described table-diamond, must be shortened by $\frac{1}{10}$ of its original. The corner ribs of the upper sides must be flattened, or run towards the centre of the table $\frac{1}{2}$ less than the sides; the lower part, which terminates in the girdle, must be $\frac{1}{2}$ of one side of the girdle; and each corner rib of the under sides must be flattened at the top, to answer the above flattening at the girdle, and at bottom must be $\frac{1}{2}$ of each side of the collet.

The parts of the small work which completes the brilliant, or the star and skill facets, are of a triangular figure. Both of these partake equally of the depth of the upper sides from the table to the girdle; and meet in the middle of each side of the table and girdle, as also at the corners. Thus they produce regular lozenges on the four upper sides and corners of the stone. The triangular facets, on the under sides, joining to the girdle, must be half as deep again as the above facets, to answer to the collet part.—The stone here described is said to be a *full-jubilated brilliant*.—If the stone is thicker than in the proportion here mentioned, it is said to be an *over-weighted brilliant*.—If the thickness is less than in this proportion, it is called a *spread-brilliant*.—The beauty of brilliants is diminished from their being either over-weighted or spread. The true proportion of the axis, or depth of the stone to its side, is as 2 to 3.—Brilliants are distinguished into square, round, oval, and drops, from the figure of their respective girdles.

Coriamb DIAMOND, a name given by many people to the crystals found in digging the mines of tin in Corn-

wal. These crystals are of the nature of the Kerry-stone of Ireland, but somewhat inferior to it: they are usually bright and clear, except towards the root, where they are coarse and foul, or whitish. They are usually found in the common form of an hexangular column terminated at each end by an hexangular pyramid.

Rose-DIAMOND is one that is quite flat underneath, with its upper part cut in divers little faces, usually triangles, the uppermost of which terminate in a point.—In rose diamonds, the depth of the stone from the base to the point must be half the breadth of the diameter of the base of the stone. The diameter of the crown must be $\frac{2}{3}$ of the diameter of the base. The perpendicular, from the base to the crown, must be $\frac{1}{2}$ of the diameter of the stone. The lozenges which appear in all circular rose-diamonds, will be equally divided by the ribs that form the crown; and the upper angles or facets will terminate in the extreme point of the stone, and the lower in the base or girdle.

Rough DIAMOND, is the stone as nature produces it in the mines.

A rough diamond must be chosen uniform, of a good shape, transparent, not quite white, and free of flaws and shivers. Black, rugged, dirty, sawy, veiny stones, and all such as are not fit for cutting, they use to pound in a steel mortar made for that purpose; and when pulverized, they serve to saw, cut, and polish the rest. Shivers are occasioned in diamonds by this. That the miners, to get them more easily out of the vein, which winds between two rocks, break the rocks with huge iron levers, which shakes, and fills the stone with cracks and shivers. The ancients had two mistaken notions with regard to the diamond: the first, that it became soft, by steeping it in hot goat's blood; and the second, that it is malleable, and bears the hammer. Experience shows us the contrary; there being nothing capable of mollifying the hardness of this stone; tho' its hardness be not such, that it will endure being struck at pleasure with the hammer.

Falsitious DIAMONDS. Attempts have been made to produce artificial diamonds, but with no great success.—These made in France, called *temple diamonds*, on account of the temple at Paris, where the best of them are made, fall vastly short of the genuine ones; accordingly they are but little valued, though the consumption thereof is pretty considerable for the habits of the actors on the stage, &c. See PASTES.

DIAMOND, in the glass-trade, an instrument used for squaring the large plates or pieces; and, among glaziers, for cutting their glass.

These sorts of diamonds are differently fitted up. That used for large pieces, as looking-glasses, &c. is set in an iron ferril, about two inches long, and a quarter of an inch in diameter; the cavity of the ferril being filled up with lead, to keep the diamond firm: there is also a handle of box or ebony fitted to the ferril, for holding it by.

DIAMOND, in heraldry, a term used for expressing the black colour in the achievements of peerage.

Guillem does not approve of blazoning the coats of peers by precious stones instead of metals and colours; but the English practice allows it. Morgan says the diamond is an emblem of fortitude.

DIANA, the goddess of hunting. According to Cicero,

**Diamond,
Diana.**

Diana.

Cicero, there were three of this name : a daughter of Jupiter and Proserpine, who became mother of Cupid; a daughter of Jupiter and Latona; and a daughter of Upis and Glaucus. The second is the most celebrated, and to her all the ancients allude. She was born at the same birth as Apollo; and the pains which she saw her mother suffer during her labour gave her such an aversion to marriage, that she obtained of her father to live in perpetual celibacy, and to preside over the travails of women. To shun the society of men, she devoted herself to hunting; and was always accompanied by a number of chosen virgins, who like herself abjured the use of marriage. She is represented with a quiver and attended with dogs, and sometimes drawn in a chariot by two white fawns. Sometimes she appears with wings, holding a lion in one hand and a panther in the other, with a chariot drawn by two heifers, or two horses of different colours. She is represented as tall; her face has something manly; her legs are bare, well shaped, and strong; and her feet are covered with a buskin worn by huntresses among the ancients. She received many surnames, particularly from the places where her worship was established, and from the functions over which she presided. She was called *Lucina*, *Ilithia*, or *Junio Eronuba*, when invoked by women in childbirth; and *Trivia* when worshipped in the cross-ways, where her statues were generally erected. She was supposed to be the same as the moon and Proserpine or Hecate, and from that circumstance she was called *Triformis*; and some of her statues represented her with three heads, that of a horse, a dog, and a boar. Her power and functions under these three characters have been beautifully expressed in these two verses:

*Tarret, laestrat, agit, Proserpina, Luna, Diana,
Ima, suprema, ferax, sceptris, fulgore, sagitta.*

She was also called *Agrotera*, *Oribia*, *Taurica*, *Delia*, *Cynthia*, *Arctia*, &c. She was supposed to be the same as the Isis of the Egyptians, whose worship was introduced into Greece with that of Osiris under the name of Apollo. When Typhon waged war against the gods, Diana metamorphosed herself into a cat to avoid his fury. She is generally known, in the figures that represent her, by the crescent on her head, by the dogs which attend her, and by her hunting habit. The most famous of her temples was that of Ephesus, which was one of the seven wonders of the world: (See *EPHESUS*). She was there represented with a great number of breasts, and other symbols which signified the earth or Cybele. Though she was the patroness of chastity, yet she forgot her dignity to enjoy the company of Endymion, and the very familiar favours which she granted to Pan and Orion are well known: (See *ENDYMION*, *PAN*, *ORION*). The inhabitants of Taurica were particularly attached to the worship of this goddess, and they cruelly offered on her altar all the strangers that were shipwrecked on their coasts. Her temple in Arctia was served by a priest who had always murdered his predecessor; and the Lacedaemonians yearly offered her human victims till the age of Lycurgus, who changed this barbarous custom for the sacrifice of flagellation. The Athenians generally offered her goats; and others a white kid, and sometimes a boar pig or an ox. Among plants, the poppy and the daisy were sacred to her. She, as well as her

brother Apollo, had some oracles; among which those of Egypt, Cilicia, and Ephesus, are the most known.

DIANE ARBOR, or *ARBOR LUNÆ*, in chemistry, the beautiful crystallizations of silver, dissolved in aquafortis, to which some quicksilver is added: and so called from their resembling the trunk, branches, leaves, &c. of a tree. See *CHEMISTRY*, n° 754.

DIANE Fanum, (anc. geog.), a promontory of Bithynia: Now *Scutari*, a citadel opposite to Constantinople, on the east side of the Bosphorus Thracicus.

DIANE Portus, a port of Corica, situated between Aleria and Mariana, on the east side.

DIANDRIA (from *di* twice, and *and* a man), the name of the second class in Linnæus's sexual system, consisting of hermaphrodite plants; which, as the name imports, have flowers with two stamina or male organs.

The orders in this class are three, derived from the number of styles or female parts. Most plants with two stamina have one style; as jessamine, lilac, privet, veronica, and bastard alaternus: vernal grass has two styles; pepper, three.

DIANIUM (anc. geog.), a town of the Contestani, in the Hither Spain; famous for a temple of Diana, whence the name: Now *Denia*, a small town of Valencia, on the Mediterranean. Also a promontory near Dianium: Now *El Cabo Martin*, four leagues from Denia, running out into the Mediterranean.

DIANTHERA, in botany: A genus of the monogynia order, belonging to the diandria class of plants; and in the natural method ranking under the 40th order, *Personate*. The corolla is ringent; the capsule bilocular, parting with a spring at the heel; the stamina each furnished with two anthers placed alternately.—There is only one species, a native of Virginia and other parts of North America. It is a low herbaceous plant, with a perennial root, sending out upright stalks a foot high, garnished with long narrow leaves of an aromatic odour, standing close to the stalks. From the side of the stalks the footstalks of the flowers are produced, sustaining small spikes of flowers.—This plant is very difficult to be preserved in Britain; for though it is hardy enough to live in the open air, it is very subject to rot in winter. It may be propagated by seeds sown on a gentle hot-bed; and in the winter the plants must be kept in a dry stove.

DIANTHUS, *CLOVE-GILLIFLOWER*, *CARNATION*, *PINK*, *SWEET-WILLIAM*, &c. A genus of the digynia order, belonging to the decandria class of plants; and in the natural method ranking under the 22d order, *Caryophyllis*. The calyx is cylindrical and monophyllous, with four scales at the base. There are five petals, with narrow heels; the capsule is cylindrical and unilocular.—There are a great number of species; but not more than four that have any considerable beauty as garden-flowers, each of which furnishes some beautiful varieties. 1. The caryophyllus, or clove-gilliflower, including all the varieties of carnation. It rises with many short trailing shoots from the root, garnished with long, very narrow, green leaves; and amidst them upright slender flower-stalks, from one to three feet high, emitting many side-shoots; all of which, as well as the main stalk, are terminated by large solitary flowers, having short oval scales to the calyx, and eregated petals. The varieties of this are very nume-

Diana.

Dianthus.

Dianthus. rous, and unlimited in the diversity of flowers. 2. The deltoides, or common pink, rises with numerous short leafy shoots crowning the root, in a tufted head close to the ground, closely garnished with small narrow leaves; and from the ends of the shoots many erect flower-stalks, from about six to 15 inches high, terminated by solitary flowers of different colours, single and double, and sometimes finely variegated. This species is perennial, as all the varieties of it commonly cultivated also are. 3. The *Chinensis*, Chinese, or Indian pink, is an annual plant with upright firm flower-stalks, branching erect on every side, a foot or 15 inches high, having all the branches terminated by solitary flowers of different colours and variegations, appearing from July to November. 4. The *barbatius*, or bearded dianthus, commonly called *sweet-william*. This rises with many thick leafy shoots, crowning the root in a cluster close to the ground; garnished with spear-shaped evergreen leaves, from half an inch to two inches broad. The stems are upright and firm, branching erect two or three feet high, having all the branches and main stem crowned by numerous flowers in aggregate clusters of different colours and variegations.

Culture. Though the carnations grow freely in almost any garden earth, and in it produce beautiful flowers, yet they are generally superior in that of a light loamy nature: and of this kind of soil the florists generally prepare a kind of compost in the following manner, especially for those fine varieties which they keep in pots. A quantity of loamy earth must be provided, of a light sandy temperature, from an upland or dry pasture-field or common, taking the top spit turf and all, which must be laid in a heap for a year, and turned over frequently. It must then be mixed with about one-third of rotten dung of old hot-beds, or rotten neat's dung, and a little sea-sand, forming the whole into a heap again, to lie three, four, or six months, at which time it will be excellent for use; and if one parcel or heap was mixed with one of these kinds of dungs, and another parcel with the other, it will make a change, and may be found very beneficial in promoting the size of the flowers. This compost, or any other made use of for the purpose, should not be sifted, but only well broken with the spade and hands.—When great quantities of carnations are required, either to furnish large grounds, or for market, or when it is intended to raise new varieties, it is easily effected by sowing some seed annually in spring, in common earth, from which the plants will rise abundantly. Several good varieties may also be expected from the plants of each sowing; and possibly not one exactly like those from which the seed was saved. The single flowers are always more numerous than the double ones; but it is from the latter only that we are to select our varieties. The season for sowing the seed is any time from the 20th of March to the 15th of April.—The plants generally come up in a month after sowing: they must be occasionally weeded and watered till July, when they will be fit for transplanting into the nursery beds. These beds must be made about three feet wide, in an open situation; and taking advantage of moist weather, prick the plants therein four inches asunder, and finish with a gentle watering, which repeat occasionally till the plants have taken good root. Here they must remain till September, when they will

be so well advanced in growth as to require more room; and should then have their final transplantation into other three feet wide beds of good earth, in rows six inches asunder, where they are to be placed in the order of quincunx. Here they are to remain all winter, until they flower, and have obtained an increase of the approved varieties of doubles by layers; and until this period, all the culture they require is, that if the winter should prove very severe, an occasional shelter of mats will be of advantage. In spring, the ground must be loosened with a hoe; they must be kept clear from weeds; and when the flower-stalks advance, they are to be tied up to sticks, especially all those that promise by their large flower-pods to be doubles.

The only certain method of propagating the double varieties is by layers. The proper parts for layers are those leafy shoots arising near the crown of the root, which, when about five, six, or eight inches long, are of a proper degree of growth for layers. The general season for this work is June, July, and the beginning of August, as then the shoots will be arrived at a proper growth for that operation; and the sooner it is done after the shoots are ready the better, that they may have sufficient time to acquire strength before winter: these laid in June and July will be fit to take off in August and September, so will form fine plants in the month of October. The method of performing the work is as follows. First provide a quantity of small hooked sticks for pegs. They must be three or four inches long, and their use is to peg the layers down to the ground. Get ready also in a barrow a quantity of light rich mould, to raise the earth, if necessary, round each plant, and provide also a sharp penknife. The work is begun by stripping off all the leaves from the body of the shoots, and shortening those at top an inch or two evenly. Then choosing a strong joint on the middle of the shoot or thereabouts, and on the back or under side thereof, cut with the penknife the joint half-way through, directing your knife upward so as to slit the joint up the middle, almost to the next joint above, by which you form a kind of tongue on the back of the shoot; observing that the swelling skinny part of the joint remaining at the bottom of the tongue must be trimmed off, that nothing may obstruct the issuing of the fibres; for the layers always form their roots at that part. This done, loosen the earth about the plant; and, if necessary, add some fresh mould, to raise it for the more ready reception of the layers; then with your finger make a hollow or drill in the earth to receive the layer; which bend horizontally into the opening, raising the top upright, so as to keep the gash or slit part of the layer open; and, with one of the hooked sticks, peg down the body of the layer, to secure it in its proper place and position, still preserving the top erect and the slit open, and draw the earth over it an inch or two, bringing it close about the erect part of the shoot; and when all the shoots of each plant are thus laid, give directly some water to settle the earth close, and the work is finished. In dry weather the waterings must be often repeated, and in five or six weeks the layers will have formed good roots. They must then be separated with a knife from the old plant, gently raised out of the earth with the point of a knife or trowel, in order to preserve the fibrous roots of the layers as entire:

Dianthus.

Dianthus,
Diapason.

tire as possible; and when thus taken up, cut off the naked sticky part at bottom close to the root, and trim the tops of the leaves a little. They are then ready for planting either into beds or pots. In November the fine varieties in pots should be moved to a sunny sheltered situation for the winter; and if placed in a frame, to have occasional protection from hard frost, it will be of much advantage. In the latter end of February, or some time in March, the layers in the small pots, or such as are in beds, should be transplanted with balls into the large pots, where they are to remain for flower. To have as large flowers as possible, curious florists clear off all side-shoots from the flower-stem, suffering only the main or top buds to remain for flowering. When the flowers begin to open, attendance should be given to assist the fine varieties, to promote their regular expansion, particularly the largest kinds called *bursters*, whose flowers are sometimes three or four inches diameter. Unless these are assisted by art, they are apt to burst open on one side, in which case the flower will become very irregular: therefore, attending every day at that period, observe, as soon as the calyx begins to break, to cut it a little open at two other places in the indenting at top with narrow-pointed scissors, and hereby the more regular expansion of the petals will be promoted: observing, if one side of any flower comes out faster than another, to turn the pot about, that the other side of the flower may be next the sun, which will also greatly promote its regular expansion. When any fine flower is to be blown as large and spreading as possible, florists place spreading paper collars round the bottom of the flowers, on which they may spread their petals to the utmost expansion. These collars are made of stiff white paper, cut circular about three or four inches over, having a hole in the middle to receive the bottom of the flower, and one side cut open to admit it. This is to be placed round the bottom of the petals in the inside of the calyx, the leaves of which are made to spread flat for its support. The petals must then be drawn out and spread upon the collar to their full width and extent; the longest ones undermost, and the next longest upon these; and so on; observing that the collar must no where appear wider than the flower; and thus a carnation may be rendered very large and handsome.

These directions will answer equally well for the propagation of the pinks and sweet-williams, though neither of these require such nicety in their culture as the carnations.

DIAPASON, in music, a musical interval, by which most authors who have wrote on the theory of music use to express the octave of the Greeks.

DIAPASON, among the musical instrument-makers, a kind of rule or scale whereby they adjust the pipes of their organs, and cut the holes of their hautboys, flutes, &c. in due proportion for performing the tones, semitones, and concords, *junt*.

DIAPASON-DIACEX, in music, a kind of compound concord, whereof there are two sorts; the greater, which is in the proportion of 10-3; and the lesser, in that of 16-5.

DIAPASON DIAPENTE, in music, a compound consonance in a triple ratio, as 3-9. This interval, says Martinius Capella, consists of 9 tones and a semitone; 19 semitones, and 38 diesis. It is a symphony made

Nº 101.

when the voice proceeds from the first to the twelfth sound.

DIAPASON DIATESSARON, in music, a compound concord founded on the proportion of 8 to 3. To this interval Martinius Capella allows 8 tones and a semitone; 17 semitones, and 34 diesis. This is when the voice proceeds from its first to its eleventh sound. The moderns would rather call it the *eleventh*.

DIAPASON DIONE, in music, a compound concord, whose terms are as 10-4, or as 5-2.

DIAPASON SEMIDIONE, in music, a compound concord, whose terms are in the proportion of 12-5.

DIAPYDEDESIS, in medicine, a transfusion of the fluids through the sides of the vessels that contain them, occasioned by the blood's becoming too much attenuated, or the pores becoming too patent.

DIAPENTE, in the ancient music, an interval marking the second of the concords, and with the diatessaron an octave. This is what in the modern music is called a *seventh*.

DIAPHANOUS, an appellation given to all transparent bodies, or such as transmit the rays of light.

DIAPHORESIS, in medicine, an elimination of the humours in any part of the body through the pores of the skin. See PERSPIRATION.

DIAPHORETICS, among physicians, all medicines which promote perspiration.

DIAPHRAGM, DIAPHRAGMA, in anatomy, a part popularly called the *midriff*, and by anatomists *septum transversum*. It is a nervous muscle, separating the breast or thorax from the abdomen or lower venter, and serving as a partition between the natural and the vital parts, as they are called. See ANATOMY, Nº 115.

It was Plato, as Galen informs us, that first called it *diaphragm*, from the verb *διαφραίνω*, to separate or be between two. Till his time it had been called *σπινς*, from a notion that an inflammation of this part produced phrensy; which is not at all warranted by experience, any more than that other tradition, that a transverse section of the diaphragm with a sword causes the patient to die laughing.

DIAPORESIS, *διαπορεσις*, in rhetoric, is used to express the hesitation or uncertainty of the speaker.

We have an example in Homer, where Ulysses, going to relate his sufferings to Alcinoüs, begins thus:

Τὶ πρῶτον, τί δ' ἔπειτα, τί δ' ἔμμενον καταλέξω;
Quid primum, quid deinde, quid postremo alloquar?

This figure is most naturally placed in the exordium or introduction to a discourse. See DOUBTING.

DIARBECK, or DIARBEEK, an extensive province of Eastern Asiatic Turkey; comprehending, in its least extent, *Diarbeke*, properly so called, *Terack* or *Chaldan*, and *Gurdistan*, which were the ancient countries of Mesopotamia, Chaldaea, and Assyria, with Babylon. It is called *Diarbeke*, *Diarbeke*, or *Diarbeke*, as signifying the "duke's country," from the word *dhyar* "a duke, and *beke* "country." It extends along the banks of the Tigris and Euphrates from north-north-west to south-east, that is, from Mount Taurus, which divides it from Turcomania on the north, to the inmost recesses of the Persian gulph on the south, about 600 miles; and from east to west, that is, from Persia on the east to Syria and Arabia Deserta on the west, in some places 200, and in others about 300, miles, but

Diapason
||
Diarbeke.

Diarbekir. but in the southern or lower parts not above 150. As extending also from the 30th to the 38th degree of latitude, it lies under part of the fifth and sixth climates whose longest day is about 14 hours and a half, and so in proportion, and consequently enjoys a good temperature of air, as well as, in the greater part of it, a rich and fertile soil. There are indeed, as in all hot countries, some large deserts in it, which produce no sustenance for men or cattle, nor have any inhabitants. Being a considerable frontier towards the kingdom of Persia, it is very well guarded and fortified; but as for those many cities once so renowned for their greatness and opulence, they are at present almost dwindled into heaps of ruins. Bagdad, Mossul, Carahmed, and a few more, indeed continue to be populous and wealthy; but the rest can scarce be called by any other name than that of sorry places. The rivers Euphrates and Tigris have almost their whole course through this country.

Diarbek Proper is bounded on the north by Turcomania, on the west by Syria, on the south by part of Arabia Deserta and Yrak Proper, and on the east by Curdistan. It was named by Moses *Padan Aram*; the latter being the general name of Syria; and the former signifying *fruitful*, a proper epithet for this country, which is really so to a very high degree, especially on the northern side, where it yields corn, wine, oil, fruits, and all necessaries of life in great abundance. Formerly it was the residence of many famed patriarchs, yet was over-run with the grossest idolatry, not only in the time of Abraham's coming out of it, and Jacob's sojourning in it, but likewise during the time it continued under the dominion of the Assyrians, Babylonians, Medes, Persians, and Romans. It received indeed the light of the gospel soon after our Saviour's ascension, from St Thaddeus, who is said to have been sent thither by St Thomas, at the request of Agbarus king of Edessa. This account, together with that monarch's letter to Jesus Christ, we have from Eusebius, who took it from the archives of that city; and the whole had passed current and uncontradicted for many ages, till our more enlightened moderns found reasons to condemn it; but whether right or wrong, it plainly appears that Christianity flourished here in a most eminent manner, till its purity was sullied about the beginning of the sixth century by the heresy of the Jacobites, whose patriarch still resides here, with a jurisdiction over all that fell in the Turkish dominions.

Diarbek Proper, is a beglerbegate, under which are reckoned two tangiaks; and the principal towns in it are, Diarbekir or Caramed, Rika, Mossul, Orfa or Edessa, Ellbir, Nisibis, Gezir Merdin, Zibin, Ur of the Chaldees, Amad, and Carafara; but all now of little note excepting Diarbekir and Mossul.

DIARBEKIR, the capital of the above district, is situated in a delightful plain, on the banks and near the head of the Tigris, about 155 miles or 15 caravan days journey, north-east from Aleppo, in latitude 37° 35', east longitude 40° 50'. The bridge of 10 arches over the said river is said to have been built by the order of Alexander the Great. It is one of the richest and most mercantile cities in all Asiatic Turkey; and is well fortified, being encompassed with a double wall, the outermost of which is flanked, with 72 towers, said to have been raised in memory of our Saviour's

72 disciples. It has several stately piazzas or market-places, well stored with all kinds of rich merchandise, and 12 magnificent mosques, said to have been formerly Christian churches. Its chief manufacture is the dressing, tanning, and dying of goat-skins, commonly called *Turkey leather*, of which the vent is almost incredible in many parts of Europe and Asia: besides this, there is another of dyed fine linen and cotton cloths, which are nearly in the same request. The waters of the Tigris are reckoned extraordinary for those two branches of trade, and give red leather a finer grain and colour than any other. There is a good number of large and convenient inns on both sides of the river, for the caravans that go to and from Persia; and on the road near the town is a chapel with a cupola, where Job is said to lie buried. This place is much frequented by pilgrims of all nations and religions, and a Turkish hermit has a cell close to it. The fair sex, who, in most other parts of the Turkish empire, are kept quite immured, and considered as mere slaves, enjoy here an extraordinary liberty, and are commonly seen on the public walks of the city in company with the Christian women, and live in great friendship and familiarity with them. The same is said of the men, who are polite, affable, and courteous, and very different from what they affect to be, especially the Turks, in other cities of this empire. The city is under the government of a basha, who has great power and very large dominions. He has commonly a body of 20,000 horse under him, for repelling the frequent incursions of the Curdes and Tartars, who always go on horseback to rob the caravans. The adjacent territory is very rich and beautiful; the bread, wine, and flesh excellent; the fruits exquisite, and the pigeons better and larger than any in Europe.

Mr Ives, who passed through this city in 1758, informs us, that "about two years ago it was very populous, its inhabitants amounting to 400,000 souls; but in the last year 300,000 died either by cold or famine. The Christians residing in the city before this calamity were reckoned to amount to 26,000, of whom 20,000 died. This account we had from one of the French missionaries, a capuchin, who also said, that before the famine the city contained 60,000 fighting men, but that now they are not able to muster 10,000. He assures us, that the houses and streets, nay the very mosques, were filled with dead; that every part of the city exhibited a dreadful image of death; and that the surviving inhabitants not only greedily devoured all kinds of beasts, brutes, and reptiles, but also were obliged to feed on human bodies. Yet, in the midst of this scene of horror, the grandees of the city had every thing in plenty; for they had taken care to monopolize vast quantities of corn, which they sold out to the other inhabitants at most extravagant prices, and thereby acquired for themselves immense fortunes. Corn rose from two piastres a measure to 50, 60, and even 70, in the space of six months. The father added, that the very severe winter of 1756, and the locusts in 1757, were the causes of this dreadful visitation: for by reason of the former, there were but few acres of land sown with corn; and by the latter, the small crop they had was in a great measure destroyed. He spoke of the severity of that winter in terms almost incredible: that it was common to see the

Diarbekir.

Diarrhoea
||
Diatonick

people fall down dead in the streets; that he himself once on quitting a warm room, and going into the open air, fell down motionless; and that his brother, in attempting to assist him, met with the same fate." This account of the effects of cold in the city of Diarbekir, which lies only in about 38° north, seems at first very surprising; but considering that the place stands on a rising ground in the midst of an extensive plain, and that the high Cordillean mountains lie to the south and east of it, and the Armenian or Turcomanian to the north, whose heads are always covered with snow, and even now in July supply the city with ice; it will not appear at all improbable, that in a very severe winter, such as was that in 1756, the inhabitants of this city should so severely feel the effects of it. Besides, fuel must have been extremely scarce, especially among the poorer sort, as nothing of this kind is produced but upon the mountains, and these lie at such a distance that the price of it must thereby be greatly enhanced.

DIARRHOEA, or LOOSENESS, in medicine, is a frequent and copious evacuation of liquid excrement by stool. See (the *Index* subjoined to) MEDICINE.

DIARTHROSIS, in anatomy, a kind of articulation or juncture of the bones; which being pretty lax, affords room for a manifest motion. The word comes from *δια*, and *arthra*, juncture, assemblage. It is opposed to *synarthrosis*, wherein the articulation is so close that there is no sensible motion at all. See ANATOMY, n° 2.

DIARY, a term sometimes used for a journal or day-book, containing an account of every day's proceedings. Thus we say, *diaries of the weather*, &c.

DIARY Fever, is a fever of one day. See EPHEMERA.

DIASCHISM, among musicians, denotes the difference between the comma and enharmonic diesis, commonly called the *lesser comma*.

DIASCORDIUM, in pharmacy, a celebrated composition, so called from *scordium*, one of its ingredients. See PHARMACY.

DIASTOLE, among physicians, signifies the dilatation of the heart, auricles, and arteries; and stands opposed to the SYSTOLE, or contraction of the same parts. See ANATOMY, n° 124.

DIASTOLE, in grammar, a figure in prosody whereby a syllable naturally short is made long. Such is the first syllable of *Præmides* in the following verse of Virgil:

Atque hic Præmides! nilil o tibi, amice, reliquum.

DIASYRMUS, in rhetoric, a kind of hyperbole, being an exaggeration of some low, ridiculous thing.

DIATESSARON, among ancient musicians, a concord or harmonical interval, composed of a greater tone, a less tone, and one greater semitone: its proportion in numbers is as 4 : 3.

DIATONICK, in music, (compounded of two Greek words, *viz.* the preposition *δια*, signifying a transition from one thing to another, and the substantive *tonos*, importing a given degree of tension or musical note), is indifferently applied to a scale or gammut, to intervals of a certain kind, or to a species of music, whether in melody or harmony, composed of these intervals. Thus we say the *diatonick* lutes, a *diatonick* interval, *diatonick* melody or harmony. As the diato-

nick scale forms the system of diatonick music, and consists of diatonick intervals, it will be necessary, for understanding the former, that we should explain the latter. See INTERVAL.

DIATRAGACANTH, in pharmacy, a name applied to certain powders, of which gun tragacanth is the chief ingredient.

DIAUGOPHRAGMIA, in natural history, a genus of fossils of the order of septaria; whose partitions or septa, consist of spar with an admixture of crystal. Of this genus there are three species. 1. A red kind, with brownish yellow partitions. 2. A brownish yellow kind, with whitish partitions. 3. A bluish-white kind, with straw-coloured partitions.

DIBBLE, or DIBBER, a simple but useful implement in gardening, used for planting out all sorts of young plants, &c.

DIBBLING WHEAT. See AGRICULTURE, n° 126.—129.

DIPIO, or DIVIO (anc. geog.), the *Divionense Castrum*, and the *Divionum* of the lower age; a town of the Lingones, in Gallia Belgica: *Dibionenses*, the people. Now *Dijon*, the capital of Burgundy. E. Long. 5. 5. N. Lat. 47. 15.

DICE, among gamblers, certain cubical pieces of bone or ivory, marked with dots on each of their faces, from one to six, according to the number of faces.

Sharps have several ways of falsifying dice. 1. By sticking a hog's bristle in them, so as to make them run high or low as they please. 2. By drilling and loading them with quicksilver: which cheat is found out by holding them gently by two diagonal corners: for if false, the heavy sides will turn always down. 3. By filing and rounding them. But all these ways fall far short of the art of the dice-makers; some of whom are so dexterous this way, that your sharpening gamblers will give any money for them.

Dice formerly paid 5s. every pair imported, with an additional duty of 4s. 9d. for every 20s. value upon oath; but are now prohibited to be imported.

DICEARCHUS, a scholar of Aristotle, composed a great number of books which were much esteemed. Cicero and his friend Pomponius Atticus valued him highly. He wrote a book to prove, that men suffer more mischief from one another than from all evils beside. And the work he composed concerning the republic of Lacedæmon was extremely honoured, and read every year before the youth in the assembly of the ephori. Geography was one of his principal studies, on which science there is a fragment of a treatise of his still extant, and preserved among the *Vetæriæ geographiæ scriptores minores*.

DICHOTOMOUS, in botany. See BOTANY, p. 442, n° 41.

DICHOTOMY, a term used by astronomers for that phasis or appearance of the moon, wherein the is bisected, or shows just half her disk. In this situation the moon is said to be in a quadrature aspect, or to be in her quadrature.

DICKER, in old writers, denotes the quantity of ten hides of skins, whereof 20 made a last: also 10 pair of gloves, ten bars of iron, and the like, are sometimes expressed by the term *dicker*.

DICKINSON (Edmund), a celebrated English physician and chemist, born in 1624. He studied and took

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took his degrees at Merton-college, Oxford; and in 1655 published there his *Delphi Phœnicizantes*, &c. a most learned piece, in which he attempted to prove, that the Greeks borrowed the story of the Pythian Apollo, and all that rendered the oracle at Delphos famous, from the Holy Scriptures, and the book of Joshua in particular: a work that procured him great reputation both at home and abroad. He practised physic first at Oxford; but removing to London in 1684, his good fortune in recovering the earl of Arlington from a dangerous sickness, procured his promotion to be physician in ordinary to Charles II. and to his household. As that prince understood and loved chemistry, Dr Dickinon grew into great favour at court; and was continued in his appointments under James II. After the abdication of his unfortunate master, being then in years, and afflicted with the stone, he retired from practice, and died in 1707. He published many other things, particularly *Physica vetus & vera*, &c. containing a system of philosophy chiefly framed on principles collected from the Mosaic history.

DICTAMNUS, WHITE DITTANY, or *Fraxinella*: A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 26th order, *Mulsiflque*. The calyx is pentaphyllous; the petals are five, and patulous; the filaments sprinkled with glandulous points; the capsules five, coalesced. There is only one species. It hath thick, penetrating, perennial roots, collected into a head at top, sending up erect stalks annually, two or three feet high, garnished with pinnated alternate leaves, of three or four pair of oblong stiff lobes, terminated by an odd one; and the stalks crowned by long, pyramidal, loose spikes of flowers, of white, red, and purple colours. They are very ornamental plants, and succeed in any of the common borders. The dittany which grows in Crete, Dalmatia, and the Morca, forms an article in the materia medica. The leaves, which are the only parts used, are imported from Italy. The best sort are well covered over with a thick white down, and now and then intermixed with purplish flowers. In smell and taste they somewhat resemble lemon-thyme, but have more of an aromatic flavour, as well as a greater degree of pungency; when fresh, they yield a considerable quantity of an excellent essential oil.

DICTATOR, a magistrate at Rome invested with regal authority. This officer was first chosen during the Roman wars against the Latins. The consuls being unable to raise forces for the defence of the state, because the plebeians refused to enlist if they were not discharged of all the debts they had contracted with the patricians, the senate found it necessary to elect a new magistrate with absolute and uncontrollable power to take care of the state. The dictator remained in office for six months, after which he was again elected if the affairs of the state seemed to be desperate; but if tranquillity was re-established, he generally laid down his power before the time was expired. He knew no superior in the republic, and even the laws were subjected to him. He was called dictator, because *dictus*, named by the consul, or *quoniam dictus eius precebat populus*, because the people implicitly obeyed his command. He was named by the consul in the night

viva voce, and his election was confirmed by the augurs. As his power was absolute, he could proclaim war, levy forces, conduct them against an enemy, and disband them at his pleasure. He punished as he pleased, and from his decision there lay no appeal, at least till later times. He was preceded by 24 lictors with the *fusces*; during his administration, all other officers, except the tribunes of the people, were suspended, and he was the master of the republic. But amidst all this independence, he was not permitted to go beyond the borders of Italy, and he was always obliged to march on foot in his expeditions, and he never could ride in difficult and laborious marches without previously obtaining a formal leave from the people. He was chosen only when the state was in imminent dangers from foreign enemies or inward seditions. In the time of a pestilence a dictator was sometimes elected, as also to hold the *comitia*, or to celebrate the public festivals, or drive a nail in the capitol, by which superstitious ceremony the Romans believed that a plague could be averted, or the progress of an enemy stopped. This office, so respectable and illustrious in the first ages of the republic, became odious by the perpetual usurpations of Sylla and J. Cæsar; and after the death of the latter, the Roman senate passed a decree which for ever after forbade a dictator to exist in Rome. The dictator, as soon as elected, chose a subordinate officer called his master of horse, *magister equitum*. This officer was respectable; but he was totally subservient to the will of the dictator, and could do nothing without his express order. This subordination, however, was some time after removed; and during the second Punic war the master of the horse was invested with a power equal to that of the dictator. A second dictator was also chosen for the election of magistrates at Rome after the battle of Cannæ. The dictatorship was originally confined to the patricians; but the plebeians were afterwards admitted to share it. Titus Lartius Flavius was the first dictator, in the year of Rome 253.

DICTION, the phrase, elocution, or style, of a writer or speaker. See ORATORY, n° 99—121.

DICTIONARY, in its original acceptation, is the arranging all the words of a language according to the order of the alphabet, and annexing a definition or explanation to each word. When arts and sciences began to be improved and extended, the multiplicity of technical terms rendered it necessary to compile dictionaries, either of science in general, or of particular sciences, according to the views of the compiler.

Dictionary of the English Language. The design of every dictionary of language is to explain, in the most accurate manner, the meaning of every word; and to show the various ways in which it can be combined with others, in as far as this tends to alter its meaning. The dictionary which does this in the most accurate manner, is the most complete. Therefore the principal study of a lexicographer ought to be, to discover a method which will be best adapted for that purpose. Dr Johnson, with great labour, has collected the various meanings of every word, and quoted the authorities; but, would it not have been an improvement if he had given an accurate definition of the precise meaning of every word; pointed out the way in which it ought to be employed with the

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Dictionary. greatest propriety; showed the various deviations from that original meaning, which custom had so far established as to render allowable; and fixed the precise limits beyond which it could not be employed without becoming a vicious expression? With this view, it would have been necessary to exhibit the nice distinctions that take place between words which are nearly synonymous. Without this, many words can only be defined in such a manner, as that they must be considered as exactly synonymous. We omit giving any quotations from Johnson, to point out these defects; and shall content ourselves with giving a few examples, to show how, according to our idea, a dictionary of the English language ought to be compiled.

IMMEDIATELY. *adv. of time.*

1. Instantly, without delay. Always employed to denote future time, and never past. Thus, we may say, *I will come immediately*; but not, *I am immediately come from such a place*. See **PRESENTLY**.
2. Without the intervention of any cause or event; as opposed to *mediately*.

PRESENTLY. *adv. of time.*

1. Instantly, without delay. Exactly synonymous with *immediately*; being never with propriety employed to denote any thing but future time.
2. Formerly it was employed to express present time. Thus, *The house presently possessed by such a one*, was often used: but this is now become a vicious expression; and we ought to say, *The house possessed at present*. It differs from *immediately* in this, that even in the most corrupt phrases it never can denote past time.

FORM. *subst.* The external appearance of any object, when considered only with respect to shape or figure. This term therefore, in the literal sense, can only be applied to the objects of the sight and touch; and is nearly synonymous with *figure*: but they differ in some respects. *Form* may be employed to denote more rude and unfinished shapes; *figure*, those which are more perfect and regular. *Form* can never be employed without denoting matter; whereas *figure* may be employed in the abstract: thus, we say a square or a triangular *figure*; but not a square or triangular *form*. And in the same manner we say, the *figure* of a house; but we must denote the substance which forms that figure, if we use the word *form*; as, *a cloud of the form of a house*, &c. See **FIGURE**.

2. In contrast to irregularity or confusion. As beauty cannot exist without order, it is by a figure of speech employed to denote beauty, order, &c.
3. As *form* respects only the external appearance of bodies, without regard to their internal qualities, it is, by a figure of speech, employed in contrast to these qualities, to denote empty show, without essential qualities. In this sense it is often taken when applied to religious ceremonies, &c.
4. As *form* is employed to denote the external appearance of bodies; so, in a figurative sense, it is applied to reasoning, denoting the particular mode

or manner in which this is conducted; as, *the Dictionary form of a syllogism*, &c.

5. In the same manner it is employed to denote the particular mode of procedure established in courts of law; as, *the forms of law, religion*, &c.
6. *Form* is sometimes, although improperly, used to denote the different circumstances of the same body; as, *water in a fluid or a solid form*. But as this phrase regards the internal qualities rather than the external figure, it is improper; and ought to be, *water in a fluid or a solid state*.
7. But when bodies of different kinds are compared with one another, this term may be employed to denote other circumstances than shape or figure: for we may say, *a juice exuding from a tree in the form of wax or resin*; although, in this case, the consistence, colour, &c. and not the external arrangement of parts, constitutes the resemblance.
8. From the regular appearance of a number of persons arranged in one long feat, such persons so arranged are sometimes called a *form*; as, *a form of students*, &c. And,
9. By an easy transition, the feat itself has also acquired that name.

GREAT. *adj.* A relative word, denoting largeness of quantity, number, &c. serving to augment the value of those terms with which it is combined, and opposed to *small* or *little*. The principal circumstances in which this word can be employed are the following:

1. When merely inanimate objects are considered with regard to quantity, *great* is with propriety employed, to denote that the quantity is considerable; as, *a great mountain, a great house*, &c. and it is here contrasted with *small*. When *great* is thus employed, we have no other word that is exactly synonymous.
2. When inanimate objects are considered with regard to their extent, this term is sometimes employed, although with less propriety; as, *a great plain, a great field*, &c. And in this sense it is nearly synonymous with *large*; and they are often used indifferently, but with some difference of meaning: for, as *large* is a term chiefly employed to denote extent of superficies, and as *great* more particularly regards the quantity of matter; therefore, when *large* is applied to any object which is not merely superficial, it denotes that it is the extent of surface that is there meant to be considered, without regard to the other dimensions: whereas when the term *great* is employed, it has a reference to the whole contents. If, therefore, we say, *a large house, or a large river*, we express that the house, the river, have a surface of great extent, without having any necessary connection with the size in other respects. But if we say, *a great house, or a great river*, it at once denotes that they have not only a large surface, but are also of great size in every respect.
3. *Great*, when applied to the human species, never denotes the size or largeness of body, but is applied solely to the qualities of the mind. Thus, when

when we say, that *Socrates was a great man*, we do not mean that he was a man of great size, but that he was a man who excelled in the endowments of the mind. The terms which denote largeness of size in the human body are, *big, bulky, huge, &c.*

4. *Great* is sometimes applied to the human species, as denoting high rank. In this case it is oftener used in the plural number than otherwise. Thus we say simply, *the great*, meaning the whole body of men in high station, as opposed to *mean*. It should seldom be employed in this sense, as it tends to confound dignity of rank with elevation of mind.

5. As this is a general term of augmentation, it may be joined with all nouns which denote *quantity, quality, number, excellence, or defects*; or such as imply *praise, blame, anger, contempt*, or any other affection of the mind.

6. It is employed to denote every step of ascending or descending consanguinity; as, *great-grandfather, great-grandson, &c.*

HIGH. *adj.* Exalted in a perpendicular direction at a distance from the surface of the earth. Opposed to *low*.

1. *High* is a term altogether indefinite, and is employed to express the degree of elevation of any inanimate body. Thus we say, a *high mountain, a high house, steeple, tower, pillar, &c.* Nor is there any other word that can here be considered as synonymous; *lofty* being employed only to denote a very eminent degree of elevation.

2. To express the perpendicular elevation of vegetables, either *high* or *tall* may be employed, as being in this case nearly synonymous. We may therefore say, a *high* or *tall tree, a high* or *tall mast, &c.* but with this difference between these two expressions, that *tall* can be more properly applied to those that are much elevated and of small dimensions; and *high*, to such as are more bulky, and of greater size.

3. The perpendicular height of man can never be expressed by the word *high*; *tall* being here the proper expression. And altho' *high* is sometimes used to express the height of other animals, yet it seems to be an improper expression. See **TALL**.

4. *High*, when applied to the human species, always refers to the mind; and denotes *haughtiness, stoutness, pride, &c.* and, when combined with the expressions of any energy of the mind, it denotes that in a higher degree. In this sense, it is opposed to *meanness, abjectness, and humility*.

5. As this is an indefinite term, tending to denote any thing that is elevated above us, it may be combined with almost every noun which admits of this elevation. And as objects high above us are always out of our reach, it is in a metaphorical sense used to denote any thing that seems to be above the ordinary condition of mankind; or those qualities or endowments of mind that are not easily acquired: as, *dignity or elevation of sentiment; dignity of rank; acuteness in reasoning on difficult subjects; pride, haughtiness, or any other quality which seems beyond the ordinary level of mankind; cleanness of price, &c.*

6. In the same manner we apply this term to time; which having a metaphorical resemblance to a river flowing on with an unceasing current through all successive ages, any thing of remote antiquity is denoted by the term *high*.

7. Likewise those degrees of latitudes far removed from the line, where the pole becomes more elevated.

8. And to some particular crimes, as being attended with peculiar degrees of guilt; as, *high treason*.

TALL. *adj.* Something elevated to a considerable degree in a perpendicular direction. Opposed to *low*.

1. This term is chiefly employed to express the height of man and other animals; and is applied to denote the height of the body only, without having any reference to the mind. When applied to man, no other word can be substituted in its stead: when applied to other animals, *high* is sometimes considered as nearly synonymous. See **HIGH**.

2. It is likewise employed to denote the perpendicular height of vegetables; and in this case, it is nearly synonymous with *high*. See **HIGH**.

3. It can in no case be employed to express the height of merely inanimate objects; as we can never say a *tall steeple, tower, or pillar*, but a *high steeple, &c.* For the distinctions in these cases, see **HIGH**.

LONG. *adj.* A relative term, denoting the distance between the extremes of any body, which is extended more in one of its geometrical dimensions than another. Opposed to *short*.

1. This term may be applied to all inanimate objects, of water kind, whose dimensions in one way exceeds the other, and when not in an erect posture, whatever be the other circumstances attending them; whether it relates to superficies alone, or to solid bodies; whether these be bounded or open, straight or crooked, flexible or rigid, or in any other circumstances whatever: thus we say, a *long* or *short line, a long* or *short ridge, street, ditch, rope, chain, staff, &c.* But it is to be observed, that although *long* is in the strict sense only opposed to *short*; yet as it expresses the extension of matter in one of its geometrical proportions, it is often contrasted by those words which express the other proportions when we mean only to describe the several proportions: as, a *table long* and *broad*. And as these several dimensions are expressed by different words, according to the various forms, modifications, and circumstances, in which bodies are found, therefore it is in this sense contrasted by a great diversity of terms: as, a *long* and *broad* or *wide, narrow* or *strait, street* or *lane; a long* and *thick, or small, rope, chain, staff*. For the distinctions in these cases, see **BROAD, WIDE, &c.**

2. Objects necessarily fixed in an erect position can never have this term applied to them; and therefore we cannot say a *long*, but a *high, tower* or *steeple*. And for the same reason, while trees are growing and fixed in an erect position, we cannot apply this term to them; but when they are fell-

ed and laid upon the ground, it is quite proper and necessary. Thus, we do not say a *long*, but a *tall* or *high* tree, while it is growing; but we say a *long*, not a *tall* log of wood: and in the same manner we say a *tall* mast, when it is fixed in the ship; but a *long* mast, while it lies upon the beach. See **TALL** and **HIGH**.

3. Those vegetables which are of a tender plant nature, or so weak as not to be able to retain a fixt position, being considered as of a middle nature between erect and prostrate bodies, admit of either of the terms *long*, *tall*, or *high*; as, a *long* or *tall* rush or willow wand, or a *long*, *tall*, or *high* stalk of corn. See **HIGH** and **TALL**.
4. The parts of vegetables, when considered as distinct from the whole, even when growing and erect, assume the term *long*: for we do not say a *tall*, but a *long*, shoot of a tree; and a tree with a *long* stem, in preference to a tree with a *high* stem.
5. For the same reason, a staff, and pole, even when fixed in a perpendicular direction, assume the word *long*, in preference to *tall* or *high*.
6. With regard to animals, the general rule is applied, without any exceptions: *tall*, and not *long*, being employed to denote the height of the human body, when in an erect posture; and *long*, and not *tall*, to denote its length when in an incumbent situation. *Long*, applied to all other animals which do not walk erect, always denotes their greatest length in a horizontal position from head to tail.
7. In a figurative sense, it denotes, with regard to time, any thing at a great distance from us.
8. As also, any thing that takes up much time before it is finished; as, a *long* discourse, a *protracted* note in music, &c.

BROAD, *adj.* The distance between the two nearest sides of any body, whose geometrical dimensions are larger in one direction than in another; and has a reference to superficies only, and never to the solid contents. Opposed to *narrow*.

1. *Broad*, in the strictest acceptation, is applied to denote those bodies only whose sides are altogether open and unconfined; as, a *broad* table, a *broad* wheel, &c.: and in these cases it is invariably contrasted by the word *narrow*; nor is there any other word which in these cases can be considered as synonymous with it, or used in its stead.
2. When any object is in some sort bounded on the sides, although not quite closed up, as a road, street, ditch, &c. either *broad* or *wide* may be employed, but with some difference of signification; *broad* being most properly used for those that are more open, and *wide* for those which are more confined; nor can this term be ever applied to such objects as are close bounded all round, as a house, a church, &c. *wide* being here employed. For the more accurate distinctions in these cases, see the article **WIDE**.

WIDE, *adj.* A term employed to denote relative extent in certain circumstances. Opposed to *narrow* and *strait*.

1. This term is in its proper sense applied only to denote the space contained within any body closed all round on every side; as a house, gate, &c.; and

differs from *broad* in this, that it never relates to the superficies of solid objects, but is employed to express the capaciousness of any body which containeth vacant space; nor can capaciousness in this sense be expressed by any other word but *wide*.

2. As many bodies may be considered either with respect to their capaciousness or superficial extent; in all these cases, either the term *broad* or *wide* may be used; as, a *broad* or *wide* street or ditch, &c. but with a greater or less degree of propriety, according to the circumstances of the object, or the idea we wish to convey. In a street where the houses are low and the boundaries open, or in a ditch of small depth and large superficies, as this largeness of superficies bears the principal proportion, *broad* would be more proper; but if the houses are of great height, or the ditch of great depth, and capaciousness is the principal property that affects the mind, we would naturally say a *wide* street or ditch; and the same may be said of all similar cases. But there are some cases in which both these terms are applied, with a greater difference of meaning; thus we say a *broad* or a *wide* gate: But as the gate is employed to denote either the aperture in the wall, or the matter which closes that aperture, these terms are each of them used to denote that particular quality to which they are generally applied: and as the opening itself can never be considered as a superficies, the term *wide*, in this case, denotes the distance between the sides of the aperture; while, on the contrary, *broad* denotes the extent of matter fitted to close that aperture; nor can these two terms in any case be substituted for one another.

3. As a figurative expression, it is used as a cant phrase for a mistake; as, *you are wide of the mark*; that is, not near the truth.

NARROW, *adj.* A relative term, denoting a proportional smallness of distance between the sides of the superficies of plain bodies. Opposed to *broad*.

1. As this is only applied to superficies, it is exactly contrasted by *broad*, and is applied in all cases where the term *broad* can be used, (see **BROAD**); and in no other case but as a contrast to it, except the following.
2. It sometimes is employed to describe the smallness of space circumscribed between certain boundaries, as opposed to *wide*, and nearly synonymous with *strait*; as we say a *wide* or a *narrow* house, church, &c. For the necessary distinctions here, see the article **STRAIT**.
3. In a figurative sense it denotes *parsimony*, *poverty*, *confined sentiments*, &c.

STRAIT, *adj.* A relative term, denoting the extent of space in certain circumstances. Opposed to *wide*; see **WIDE**.

1. This term is employed, in its proper sense, to denote only space, as contained between surrounding bodies in such circumstances as to denote some degree of confinement; and is exactly opposed to *wide*; as, a *wide* or a *strait* gate, &c. See **WIDE**.
2. So necessary is it that the idea of confinement should

should be connected with this word, that in all those cases where the space contained is large, as in a church or house, we cannot express a smaller proportional width by this term. And as we have no other word to express space in these circumstances, we have been obliged to force the word *narrow* from its natural signification, and make it express this. See *NARROW*.

3. In some particular cases, *narrow* or *strait* may be employed to the same object: as, a *narrow* or a *strait* line: but here *strait* is never employed but where an idea of confinement is suggested, and where it is exactly contrasted to *wide*; nor can *narrow* be employed but in such circumstances where *broad* would be a perfect contrast to it. Therefore these two terms may be always employed in the same circumstances as those which contrast them may be. For an account of which, see *WIDE*.

3. The term *strait* is likewise in a peculiar manner used to denote the smallness of the internal diameter of those small bodies which are fitted to receive or contain others, as any kind of bag, tube, body-clothes, mortises, and others of the same kind; and in all these cases this term may be employed to denote the smallness of their lesser diameter, and never the term *narrow*. But in certain circumstances the word *tight* may be substituted for it. See *TIGHT*.

4. *Strait*, in a figurative sense, denotes any sort of confinement of sentiment or disposition.

TIGHT. *adj.* A term employed in certain circumstances to denote the internal capacity of particular bodies. Nearly synonymous with *strait*.

This term is confined entirely to denote the smallness of the internal dimensions of such objects as are formed to cover or to receive or contain other solid bodies, and can be employed in no other case. And although it agrees with *strait*, in always denoting confinement, and by being applicable to the same species of objects, yet it differs in the following respects: 1. If there be any difference of the diameter of the objects to which the term *strait* can be applied, it always has reference to the smaller; yet *tight* may be applied to any sort of confinement, whether it regards the length or breadth. 2. *Strait* can be applied to all bodies of capacity when of small diameter, without any sort of reference to the nature of the substance which it may be capable of containing. For we can say a *strait* bag, a *strait* sleeve, a *strait* mortise, a *strait* gate, &c. whereas *tight* can only be applied to any body when it is considered as having reference to another body which is intended to be contained in it, and is pinched for want of room. Thus we say, the *sleeve* of a coat is too *tight* for the arm, the *mortise* is too *tight* for the tenon, &c.; but we cannot say, the *bag*, or the *gate*, is too *tight*, because these are fitted to receive any sort of objects. And hence it happens, that, in many cases, the dimensions of the same body may be expressed by *tight* or *strait* when considered in different circumstances. Thus we may say, this *sleeve* is too *strait*, when we look at

a coat when lying on the table, and consider its proportions; but it is not till we have tried it upon the arm that it is intended to cover, that we call it *tight*. And we may say, a *gate* is too *strait*, or too *tight*: but in the first case we consider it as being too confined for admitting objects to pass through it; and in the last, as being too confined with respect to the leaves that are to shut the aperture, not allowing them space to move with freedom.

These examples may serve to give some idea of the plan of an English Dictionary composed upon philosophical principles: But, besides the circumstances above enumerated, there are many others which would require particular attention in the execution of a work of this kind. In the English language, a great variety of terms occur, which denote matter under certain general forms or circumstances, without regarding the minute diversities that may take place; as the word *cloth*, which denotes matter as manufactured into a particular form, including under it all the variety of stuffs manufactured in that particular way, of whatever materials, colours, texture, or fineness, they may be. The same may be said of *wood*, *iron*, *yarn*, and a great variety of terms of the same nature, some of which cannot assume any plural; while others admit of it in all cases, and others admit or refuse it according to the different circumstances in which they are considered. In a dictionary, therefore, all this variety of cases ought to be clearly and distinctly pointed out under each particular article: this is the more necessary, as some of these words have others formed from them, which might be readily mistaken for their plurals, altho' they have a very different signification; as *cloaths*, which does not denote any number of pieces or different kinds of *cloth*, but *wearing apparel*. The following example will illustrate this head.

WOOD. *sub.* A solid substance, of which the trunks and branches of trees consist.

1. This term is employed to denote the solid parts of vegetables of all kinds, in whatever form or circumstances they are found. Nor does this term admit of plural with propriety, unless in the circumstances after-mentioned: for we say, many different kinds of *wood*, in preference to many kinds of *woods*; or, we say, *oak*, *ash*, or *elm wood*, not *woods*.

2. But where we want to contrast *wood* of one quality or country with that of another, it admits of a plural: for we say, *white woods* are in general softer than red; or *West-Indian woods* are in general of greater specific gravity than the *European woods*: But unless where the colour, or some quality which distinguishes it from growing wood, is mentioned, this plural ought as much as possible to be avoided, as it always suggests an idea of growing wood.

3. *Wood* likewise denotes a number of trees growing near one another; being nearly synonymous with *forest*: See *FOREST*. In this sense it always admits of a plural; as, *The woods and wilds* *about* *solitary gloom*, &c.

A dictionary cannot be reckoned complete without explaining obsolete words; and if the terms of the

Dictionary. verbal provincial dialects were likewise given, it would be of great utility : nor would this take much time ; because a number of these words needs no other explanation than to mark along with them the words which had come in their place, when these happened to be one perfectly synonymous : and in those cases where the same idea could not be expressed in modern language without a periphrasis, it would be of use to explain them distinctly ; so that, when a writer found himself at a loss for a term, and obliged to search for one beyond the bounds of our own language, he might take one of these, when he found that it was expressive and energetic, in preference to another drawn from a foreign language. This would at least have one good effect : it would make our language more fixed and stable ; not to say more accurate and precise, than by borrowing from foreign languages. The following examples may serve to give some idea of the manner of treating this part of the work.

MOE, or **MO**, *adj.* An obsolete term still employed in the Scotch dialect, and by them pronounced *moe* ; denoting a greater number, and nearly synonymous with *more* ; but it differs in this respect, that in the Scotch dialect, *mae* and *mair* (English *more*) are each employed in their distinct sphere, without encroaching upon one another ; *moe* being employed to denote number, but never quantity or quality ; and *mair*, to denote quantity and quality, but never number : thus they say *mae*, not *mair*, *apples*, *men*, &c., and they say *mair*, not *moe*, *cloth*, *carib*, *courage*, &c. See **MAIR**. Both of these terms are supplied by the word *more* ; which in the English language is applied indiscriminately to denote quantity, quality, and number. See **MORE**.

THIR, *pron.* Obsolete ; still employed in the Scotch dialect : the plural of *this* ; and contrasted to *these*, in the same manner as *that* is to *this*.

As there is no word in the English language equivalent to this, we thus show the manner in which it is employed. In the English language we say, *that stone or house*, pointing at one at a distance, *is larger or more commodious than this stone or this house*, which is supposed to be at hand. In the same manner, in the Scotch dialect, they say, *these* (or, as it is pronounced, *thae*) *stones are rubier than thir stones* ; denoting, that the former are at a distance, and the latter at hand. And, in the same manner, it is invariably applied to denote any present object in the plural number, as opposed to *these* : as *these* or *thir apples*, as at hand, or at a distance ; *these*, or *thir trees*, &c. ; but never in the singular number, as it is always *this* or *that tree*, *house*, &c.

As the English language is so exceedingly irregular in the pronunciation, the same letter in the same situation often assuming sounds totally different in different words, it is impossible to establish any general rules on this subject, which do not admit of many exceptions : therefore, a dictionary is the best means of ascertaining and pointing out the proper pronunciation of words. For, if the writer first pointed out all the different sounds that the same letter could ever be made to express, and assigned to every particular sound which

each letter could be made to assume, a particular mark, which was appropriated to denote that particular sound of the letter whenever it occurred ; by placing these particular marks above the letters in the dictionary, the sound of each letter would be pointed out in all cases with the utmost certainty. It would be impossible for us to illustrate this by examples, without first ascertaining all the sounds of each letter ; which would lead us into a discussion too long for this place.

We shall only further observe, that, besides having the accented syllable of every word properly distinguished in a dictionary to assist in the pronunciation, the English language requires another essential improvement, *viz.* the use of accents to distinguish the meaning of words and phrases : which, although it is not so properly confined to a lexicographer, yet it is not quite without his sphere. Thus the word *as* admits of two very different sounds, as well as different significations ; as in this example, " Cicero was nearly as eloquent as Demosthenes " in which the first *as* is pronounced *ast*, and the last is pronounced *ax*. Now, it often happens, that, in reading, the particular way in which it ought to be understood is not pointed out by the context, till after the word itself is pronounced, which has an equal chance at least of being pronounced wrong ; whereas, if it were always accented when employed in the one sense, and not in the other, it would free the reader from this perplexity. There are other cases in which the use of proper accents in writing would be of great consequence ; as at the beginning of a sentence, when it was put as a question, or used ironically, &c. the want of which every one must have observed. But as this does not so properly belong to the lexicographer as the grammarian, we shall here take no further notice of it.

The above examples, we hope, will be sufficient to give the reader some idea of the plan that we would propose ; and enable him to determine, whether or not a dictionary, executed upon this plan, would convey to his mind a more perfect knowledge of the English language, than those dictionaries that have been hitherto published. These examples were given rather with a view to show the manner in which a work of this kind might be conducted, than as perfect and unexceptionable explanations of the several articles there enumerated ; and therefore we did not think it necessary to produce any authorities, although we are sensible that they would be requisite in such a work.

DICTYMNIA, or **DICTYNNIA**, in mythology, were feasts celebrated at Lacedæmon and in Crete, in honour of Diana Dictymnia or Dictynnia, or of a nymph taken for her, who, having plunged herself into the sea, to escape the passion of Minos, was caught in a fisherman's net or *δίκτυον*, whence the name.

DICTYS (Cretensis), a very ancient historian, who serving under Idomeneus king of Crete in the Trojan war, wrote the history of that expedition in nine books ; and Tzetzes tells us, that Homer formed his Iliad upon the plan of that history. It is however maintained, that the Latin history of Dictys which we have at present is spurious.

DIDACTIC, in the schools, signifies the manner of speaking or writing, adapted to teach or explain the

Didapper, the nature of things.—The word is formed from the *Didelphis* Greek *didaxo, doceo*, “I teach.”

There are many words that are only used in the didactic and dogmatic way: and there are many works, ancient and modern, both in prose and verse, written after this method: such are the *Georgics* of Virgil, Lucretius's poem *De Rerum Natura*, and Pope's *Essays on Criticism* and on *Man*, &c. &c.

DIDAPPER, in ornithology. See *COLYMBUS*.

PLATE CLV. *DIDELPHIS*, or *OPOSSUM*, in zoology; a genus (in Vol. V.) of quadrupeds belonging to the order of *feræ*, the characters of which are these: They have ten fore-teeth in the upper jaw, and eight in the under one. The dog-teeth are long; the tongue is somewhat ciliated; and they have a pocket formed by a duplicature of the skin of the belly, in which the dugs are included.

1. The *marfupialis*, or *Virginian* opossum, has a long sharp-pointed nose; large, round, naked, and very thin ears; small, black, lively, eyes; long stiff hairs on each side the nose, and behind the eyes: the hind part of the neck and back covered with hair two inches long; the bottoms of a yellowish white, middle part black, ends whitish: the sides covered with hair of a dirty and dusky colour; the belly with soft, woolly, dirty white hair: the tail, for near three inches, clothed with long hairs like those on the back; the rest of the tail covered with small scales. The tail of this animal has a disagreeable appearance, looking like the body of a snake, and has the same prehensile quality with that of some monkeys; the body is round and pretty thick, the legs short: on the lower part of the belly of the female is a large pouch, in which the teats are lodged, and where the young shelter as soon as they are born. The length of the body is 16 or 17 inches; that of the tail 14.—This creature inhabits many parts of America and the East Indies. It is very destructive to poultry, and sucks the blood without eating the flesh; it feeds also on roots and wild fruits, and is very active in climbing trees. It hunts eagerly after birds and their nests; and will hang suspended from the branches of a tree by its tail; then, by swinging its body, it will fling itself among the trees that grow in the neighbourhood. It walks very slow; and when pursued and overtaken will feign itself dead. It is not easily killed, being as tenacious of life as a cat. When the female is about to bring forth, she makes a thick nest of dry grass in some close bush at the foot of a tree; and brings four, five, or six, young at a time. As soon as the young are brought forth, they take shelter in the pouch or false belly; and fasten so closely to the teats, that they cannot be separated without difficulty. They are blind, naked, and very small, when new-born, and resemble fetuses: it is therefore necessary that they should continue in that false belly till they attain proper strength and sight; and are prepared to undergo what may be called a *second birth*. After this they run into the pouch as into an asylum in time of danger; and the parent carries them about with her. During the time of this second gestation, the female shows an excessive attachment to her young, and will suffer any torture rather than allow this receptacle to be opened; for she has the power of opening or closing it by the assistance of some very strong muscles. The flesh of the old animal is very good, like that of a sucking pig: the hair

is dyed by the Indian women, and wove into garters and girdles: the skin is very fetid.

2. The *Molucca* opossum has long, oval, and naked ears: the mouth is very wide: the lower side of the upper jaw, throat, and belly, is of a whitish ash colour; rest of the hair a cinereous brown tip with tawny, darkest on the back: the tail is as long as the body; near the base covered with hair, the rest naked: the claws are hooked. On the belly of the female is a pouch, in which the young (like those of the former) shelter. Marcgrave found six young within the pouch. It has ten cutting teeth above and eight below. The length of the animal from nose to tail is ten inches; and the tail exceeds the length of head and body. Its whole figure is of a much more slender and elegant make than the former. The tail pulverised, and taken in a glass of water, is reckoned in New Spain a sovereign remedy against the gravel, colic, and several other disorders. This species is found in great numbers in Aroe and Solor: It is called in the Indies *pelandor aroe*, or the *aroe rabbit*. They are reckoned very delicate eating; and are very common at the tables of the great, who rear the young in the same places in which they keep their rabbits. It inhabits also Surinam, and the hot parts of America.

3. The *murina*, or *murine* opossum, hath the face and upper parts of the body of a tawny colour; the belly of a yellowish white: the tail is slender, and covered with minute scales to the very rump: the length of the animal from nose to tail, about six inches and a half; the tail of the same length: the female wants the false belly of the former; but on the lower part the skin forms on each side a fold, between which the teats are lodged. It inhabits the hot parts of South America; agrees with the others in its food, manners, and the prehensile power of its tail. It brings from 10 to 14 young ones at a time; they affix themselves to the teats as soon as they are born, and remain attached like inanimate things, till they attain growth and vigour to shift a little for themselves.

4. The *Mexican* opossum, is of an ash-colour on the head and upper parts of the body: the belly and legs are whitish: the tail is long and pretty thick, varied with brown and yellow; it is hairy near an inch from its origin, the rest naked: the length of the animal from nose to tail, about seven inches and a half; of the tail, more than 11.—It inhabits the mountains of Mexico, and lives in trees, where it brings forth its young: when in any fright, they embrace the parent closely. The tail is prehensile, and serves instead of a hand.

5. The *phalanger*, or *Surinam* opossum of Buffon, has the upper part of the body reddish, mixed with a light ash-colour and yellow: the under parts are of a dirty yellowish white; the bottom of the tail is covered with hair, for near two inches and a half; the rest naked: the length of the animal from nose to tail is near nine inches; the tail ten. It inhabits Surinam, according to Buffon; who supposes it may be the species called by the colonists the *cane-rat*, which is so destructive to the sugar-canes. According to Dr Pallas, it inhabits the East India islands, but is not found in Surinam.

6. The *dorsifera*, or *merian* opossum, hath the head and upper part of the body of a yellowish brown colour; the belly white, and tinged with yellow; the

Didelphis

Didelphis. tail very long and slender, and, except at the base, quite naked.—It is a native of Surinam, and burrows under ground: it brings five or six young at a time, which follow their parent: on any apprehension of danger, they all jump on her back; and twisting their tails round her's, she immediately runs with them into her hole.

7. The kangaroo. This animal has a small head, neck, and shoulders; the body increasing in thickness to the rump. The head is oblong, formed like that of a fan, and tapering from the eyes to the nose; end of the nose naked and black; the upper lip divided. The nostrils are wide and open; the lower jaw is shorter than the upper; and the aperture of the mouth small: there are whiskers on both jaws, those on the upper longest; and strong hairs above and below the eyes. The eyes are not large; the irides are dusky; the pupil is of a bluish black. The ears are erect, oblongly ovate, rounded at the ends, and thin, covered with short hairs; four inches long. There are no canine teeth; but six broad cutting teeth in the upper jaw; two long lanceolated teeth in the lower, pointing forward; and four grinding teeth in each jaw, remote from the others. The belly is convex and great. The fore legs are very short, scarcely reaching to the nose; and useless for walking. The hind legs are almost as long as the body; and the thighs are very thick: on the fore feet are five toes, with long conic and strong claws; on the hind feet, only three: the middle toe is very long and thick, like that of an ostrich; the two others are placed very distinct from it, and are small: the claws are short, thick, and blunt: the bottom of the feet, and hind part, black, naked, and tuberculated, as the animal rests often on them. The tail is very long, extending as far as the ears; thick at the base, tapering to a point. The scrotum is large and pendulous. The hair on the whole animal is soft, and of an ash-colour; lightest on the lower parts. The dimensions of a full grown animal are not yet known. The following are those of a male lately sent to Lord Sidney by Governor Phillip.

Length from the point of the nose to the end	f.	in.
of the tail, - - - - -	8	5
Length of the tail, - - - - -	3	1
----- head, - - - - -	0	11
----- fore legs, - - - - -	2	0
----- hind legs, - - - - -	3	7
Circumference of the fore part by the legs,	1	9
----- lower parts - - - - -	4	5
Round the thicker part of the tail, which gradually tapers to the end. - - - - -	1	1

The above is the largest kangaroo that has yet been seen, and we are told there is every reason to believe that even this had not nearly attained its full growth.

It inhabits the western side of New Holland, and has as yet been discovered in no other part of the world. It lurks among the grass; and feeds on vegetables: it goes entirely on its hind legs; making use of the fore feet only for digging, or bringing its food to its mouth. The dung is like that of a deer. It is very timid: at the sight of men it flies from them by amazing leaps, springing over bushes seven or eight feet high; and going progressively from rock to rock. It

carries its tail quite at right angles with its body when it is in motion; and when it alights, often looks back.

In the account lately published of Governor Phillip's Voyage, we are told that these animals have been seen feeding in herds of about 30 or 40; and that one is always observed to be apparently on the watch at a distance from the rest.—The largest kangaroo which has yet been shot, we are there told, weighed about 140 pounds. But it has been discovered that there are two kinds, one of which seldom exceeds 60 pounds in weight: these live chiefly on the high grounds: their hair is of a reddish cast, and the head is shorter than the larger foot. Young kangaroos which have been taken, have in a few days grown very tame, but none have lived more than two or three weeks. Yet it is still possible that when their proper food shall be better known, they may be domesticated. Near some water was found the dung of an animal that fed on grass, which, it was supposed, could not have been less than a horse. A kangaroo, so much above the usual size, would have been an extraordinary phenomenon, though no larger animal has yet been seen, and the limits of growth in that species are not ascertained. The tail of the kangaroo, which is very large, is found to be used as a weapon of offence, and has given such severe blows to dogs as to oblige them to desist from pursuit. Its flesh is coarse and lean, nor would it probably be used for food, where there was not a scarcity of fresh provisions.

Mr Pennant observes, that this is a very anomalous animal; but ranks it under this genus as having more relation to it than to any other. In the account of Phillip's Voyage, however, we are informed, that the pouch of the female, hitherto esteemed peculiar to the opossum genus, has been found both in the rat and the squirrel kind in New Holland.

8. The quoll, or spotted opossum, is described as in length from the nose to the beginning of the tail about 15 inches, and the tail about nine or ten. The general colour black, inclining to brown beneath; the neck and body, spotted with irregular roundish patches of white; the ears pretty large and erect; the visage pointed, the muzzle furnished with long slender hairs; the legs, from the knees downward, almost naked, and ash-coloured; on the fore feet are five claws, and on the hind, four and a thumb without a claw; the tail, for about an inch and an half from the root, is covered with hairs of the same length as those on the body, from thence to the end with long ones not unlike that of a squirrel. The female has six teats placed in a circle within the pouch.

9. The kangaroo rat is described as similar, both in the general shape of the body and the conformation of the legs, to the kangaroo; but the visage having a strong resemblance to that of the rat, and the colour of the whole not ill resembling that animal, it has obtained the name of the *kangaroo rat*. It is an inhabitant of New Holland; and two of the species are now to be seen alive at the curious exhibition of animals over Exeter Exchange; where one of them, being a female, has brought forth young. This species has two cutting teeth in front of the upper jaw, with three others on each side of them; and at a distance

Didelphis. one false grinder, sharp at the edge, and channelled or fluted on the sides; and close to these, two true grinders: in the lower jaw there are two long cutting teeth formed like those of the squirrel, with three grinders corresponding with those in the upper jaw.

10. The flying opossum, a beautiful species, and clothed with fur of the most exquisite texture, is an inhabitant of New Wales. In length, from the tip of the nose to the root of the tail, it is 20 inches; the tail itself is 22 inches, at the base quite light, increasing gradually to black at the end: the ears are large and erect: the coat or fur is of a richer and most delicate texture; appearing, on the upper parts of the body, at first sight, of a glossy black, but on a nicer inspection found to be mixed with grey; the under parts are white, and on each hip is a tan-coloured spot nearly as big as a shilling; at this part the fur is thinnest, but at the root of the tail it is so rich and close that the hide cannot be felt through it. The fur is also continued to the claws. On each side of the body is a broad flap or membrane (as in the flying squirrels), which is united to both the fore and hind legs. The jaws are furnished with teeth, placed as in some others of this genus: in the upper jaw forwards are four small cutting teeth, then two canine ones, and backwards five grinders: the under jaw has two long large cutting teeth, five grinders, with no intermediate canine ones, the space being quite vacant. The fore legs have five toes on each foot, with a claw on each; the hinder ones four toes, with claws (the three outside ones without any separation), and a thumb without a claw, enabling the animal to use the foot as a hand, as many of the opossum tribe are observed to do.

11. The Cayenne opossum has a long slender face: ears erect, pointed, and short: the coat woolly, mixed with very coarse hairs, three inches long, of a dirty white from the roots to the middle; from thence to the ends of a deep brown; sides and belly of a pale yellow; legs of a dusky brown; thumb on each foot distinct; on the toes of the fore feet, and thumb of the hind, are nails; on the toes of the hind feet crooked claws; tail very long, taper, naked, and scaly. Length 17 French inches; of the tail fifteen and a half. The subject measured was young. Inhabits Cayenne: very active in climbing trees, on which it lives the whole day. In marshy places, feeds on crabs, which when it cannot draw out of their holes with its feet, it hooks them by means of its long tail. If the crab pinches its tail, the animal sets up a loud cry, which may be heard afar: its common voice is a grunt like a young pig. It is well furnished with teeth, and will defend itself stoutly against dogs; brings forth four or five young, which it secures in some hollow tree. The natives eat these animals, and say their flesh resembles a hare. They are easily tamed, and will then refuse no kind of food.

12. The New Holland opossum has the upper part of the head, and the back and sides, covered with long, soft, glossy hairs, of a dark cinereous colour at the bottoms, and of a rusty brown towards the ends: the belly is of a dirty white. The tail is taper, covered with short brown hairs, except for four inches and a half of the end, which is white, and naked un-

derneath; the toes like those of the former. Described by Mr Pennant from a skin, the length of which, from the head to the tail, was 13 inches, and the tail the same. The animal was found near Endeavour river, on the eastern coast of New Holland, with two young ones. It lodges in the grass, but is not common. There are two or three other species.

DIDO, called also ELISA, a daughter of Belus king of Tyre, who married Sicheus or Sicharbas her uncle, who was priest of Hercules. Pygmalion, who succeeded to the throne of Tyre after Belus, murdered Sicheus to get possession of the immense riches which he had; and Dido, disconsolate for the loss of her husband, whom she tenderly loved, and by whom she was equally esteemed, set sail in quest of a settlement with a number of Tyrians, to whom the cruelty of the tyrant became odious. According to some accounts, she threw into the sea the riches of her husband which Pygmalion so greedily desired, and by that artifice compelled the ships to fly with her that had come by order of the tyrant to obtain the riches of Sicheus. During her voyage, Dido visited the coast of Cyprus; where she carried away 50 women who prostituted themselves on the sea-shore, and gave them as wives to her Tyrian followers. A storm drove her fleet on the African coast, and she bought of the inhabitants as much land as could be covered by a bull's hide cut into thongs. Upon this piece of land she built a citadel called *Byrsa*; and the increase of population, and the rising commerce among her subjects, soon obliged her to enlarge her city and the boundaries of her dominions. Her beauty, as well as the fame of her enterprise, gained her many admirers; and her subjects wished to compel her to marry Iarbas king of Mauritania, who threatened them with a dreadful war. Dido begged three months to give her decisive answer; and during that time she erected a funeral pile, as if wishing by a solemn sacrifice to appease the manes of Sicheus, to which she had promised eternal fidelity. When all was prepared, she stabbed herself on the pile in presence of her people; and by this uncommon action obtained the name of *Dido*, "valiant woman," instead of Elisa. According to Virgil and Ovid, the death of Dido was caused by the sudden departure of Æneas; of whom she was deeply enamoured, and whom she could not obtain as a husband. This poetical fiction represents Æneas as living in the age of Dido, and introduces an anachronism of near 300 years. Dido left Phœnicia 247 years after the Trojan war or the age of Æneas, that is, about 953 years before Christ. This chronological error proceeds not from the ignorance of the poets, but it is supported by the authority of Horace:

Aut famam sequere, aut sibi convenienti fuge.

While Virgil describes, in a beautiful episode, the desperate love of Dido, and the submission of Æneas to the will of the gods, he at the same time gives an explanation of the hatred which existed between the republics of Rome and Carthage; and informs his reader, that their mutual enmity originated in their very first foundation, and was apparently kindled by a more remote cause than the jealousy and rivalry of two flourishing empires. Dido after her death was honoured as a deity by her subjects.

Didus.

DIDUS, or *dodo*, in ornithology, a genus belonging to the order of gallinæ. The bill is contracted in the middle by two transverse rugæ; each mandible is inflected at the point; and the face is bare behind the eyes. Only one species, the ineptus, is mentioned by Linnæus; but three are described by Buffon: though it is doubted whether on further observation they may not all prove one and the same species, differing only in sex or age.

1. The dronte, or hooded dodo, (ineptus, *Lin.*), is somewhat bigger than a swan, and near three feet in length. The bill is strong, large, and hooked at the end; the gape stretches beyond the eyes: the colour of it is a very pale blue; except the end of the upper mandible, which is yellowish, and a red spot on the bend of it; the end of the lower is blackish: the irides are white. The general colour of the plumage is cinereous, and soft to the touch; the belly and thighs are whitish. The head is large, and seems as it were covered with a black hood or cowl. The wings are very short, and of a yellowish ash-colour: the tail feathers are curled, stand up on the rump, and incline to yellow. The legs have four toes, three before and one behind; are very stout, short, and yellowish: the claws are black. It inhabits the islands of Mauritius and Bourbon in the Indian Ocean.

2. The solitaire, or solitary dodo, is a large bird, and the male is said to weigh sometimes 45 pounds. The neck is of a proportionable length, and the eye black and lively: the head is not crested, and the general colour of the plumage is grey and brown mixed: it has scarce any tail, and the bastard wing swells out into a round knob: the wings are too short for flight; and the hind parts are rounded like a horse's rump, being clothed with feathers, which may be termed *coverts*. — The females are covered with sometimes brown and sometimes light yellow feathers, and appear very beautiful. The feathers on each side of the breast enlarge into two white tufts, somewhat resembling the bosom of a woman. Those of the thighs are rounded at the end like shells; and, according to Leguat, the bird has altogether a noble and elegant gait. This is an inhabitant of the Isle of Rodrigue, where it is not uncommon; but not met with in flocks, scarcely more than two being found together. It makes the nest in by-places, of leaves of the palm, a foot and a half in thickness; and lays one egg, bigger than that of a goose. The male sits in his turn; and does not suffer any bird to approach within 200 yards of the spot while the hen is sitting, which is seven weeks. The young is some months before it can shift for itself; the old ones, in the mean time, are affectionate to it, and faithful to each other afterwards, though they occasionally may mix with others of their kind. The young birds, though timid, are stupid enough to suffer the approach of any one; but when grown up are more shy, and will not be tamed. They are chased in the winter season, *viz.* from March to September; being then fat, and the young birds are much esteemed for the table.

3. The Nazarene dodo is bigger than a swan. The bill is a little bent downwards and large: instead of feathers, the whole is covered over with a black down; but the wings are feathered, and it has some frizzled

ones upon the rump, which serve instead of a tail; the legs are long and scaly, and there are three toes on each foot. This was met with in the Isle of France, and described as above by Fr. Cauche; who adds, that the female only lays one egg, which is white, and as big as a penny loaf, and that there is always found with it a white stone of the size of an hen's egg; that it makes the nest of leaves and dry herbs, in the forests, on the ground; and that there is likewise found a grey stone in the gizzard of the young bird.

DIDYMUS of Alexandria, an ecclesiastical writer of the fourth century; who, though he is said to have lost his eyes at five years of age, when he had scarcely learned to read, yet applied so earnestly to study, that he attained all the philosophic arts in a high degree, and was thought worthy to fill the chair in the famous divinity-school at Alexandria. He was the author of a great number of works: but all we have now remaining are, a Latin translation of his book upon the Holy Spirit, in the works of St Jerome, who was the translator; short frictions on the Canonical Epistles; and a book against the Manichees.

DIDYNAMIA (from *δύω*, twice, and *δύναμις*, power), the name of the 14th class in Linnæus's sexual method; consisting of plants with hermaphrodite flowers, which have four stamina or male organs, two of which are long and two short. See BOTANY, the Scheme, and Plate CII. fig. 14.

DIEMEN'S LAND, the southern coast or point of New Holland, S. Lat. 43° 21' 20", E. Long. 147° 29'. This coast was discovered in November 1642 by Tasman, who gave it the name of *Van Diemen's Land*. Captain Furneaux touched at it in March 1773, and the country has been since further explored by our late navigators. Here is a very safe road, named by Captain Cook *Adventure Bay*. The parts adjoining to the bay are mostly hilly, and form an entire forest of tall trees, rendered almost impassable by brakes of fern, shrubs, &c. The soil on the flat land, and on the lower part of the hills, is sandy, or consists of a yellowish earth, and in some parts of a reddish clay; but further up the hills it is of a grey tough cast. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor stones of any other kind than the white sand-stone, were observed: nor any vegetables that afforded subsistence for man. The forest-trees are all of one kind, generally quite straight, and bearing clusters of small white flowers. The principal plants observed were wood-sorrel, milk-wort, cudweed, bell-flower, gladiolus, samphire, and several kinds of fern. The only quadruped seen distinctly was a species of opossum, about twice the size of a large rat. The kangaroo, found farther northward in New Holland, may also be supposed to inhabit here, as some of the inhabitants had pieces of the skin of that animal. The principal sorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowish paroquets, and a species which was called *motacilla cyanæa*, from the beautiful azure colour of its head and neck. On the shore were several gulls, black oyster-catchers or sea-pies, and plovers of a stone-colour. In the woods were seen some blackish snakes of a pretty large size; and a species of lizard fifteen inches long and six round, beautifully

Didymus
ff.
Diemen's
Land.

Diemens
Land
||
Diet: pe.

Dies
||
Diet.

fully clouded with yellow and black. Among a variety of fish caught, were some large rays, nurse, leather-jackets, bream, soles, flounders, gurnards, and elephant-fish. Upon the rocks are muscles and other shell-fish, and upon the beach were found some pretty Medusa's heads. The most troublesome insects met with were the musquitoes; and a large black ant, the bit of which inflicts extreme pain.

The inhabitants seemed mild and cheerful, with little of that wild appearance which savages in general have. They are almost totally devoid of personal activity or genius, and are nearly upon a par with the wretched natives of Terra del Fuego. They display, however, some contrivance in their method of cutting their arms and bodies in lines of different directions, raised above the surface of the skin. Their indifference for presents offered them, their general inattention and want of curiosity, were very remarkable, and testified no acuteness of understanding. Their complexion is a dull black, which they sometimes heighten by smutting their bodies, as was supposed from their leaving a mark behind on any clean substance. Their hair is perfectly woolly, and is clotted with grease and red ochre like that of the Hottentots. Their noses are broad and full, and the lower part of the face projects considerably. Their eyes are of a moderate size; and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleasing cast. Their teeth are not very white nor well set, and their mouths are wide: they wear their beards long and clotted with paint. They are upon the whole well proportioned, though their belly is rather protuberant. Their favourite attitude is to stand with one side forward, and one hand grasping across the back the opposite arm, which on this occasion hangs down by the side that projects.

Near the shore in the bay were observed some wretched constructions of sticks covered with bark; but these seemed to have been only temporary, and they had converted many of their largest trees into more comfortable and commodious habitations. The trunks of these were hollowed out to the height of six or seven feet by means of fire. That they sometimes dwell in them was manifest from their hearths in the middle made of clay, round which four or five persons might sit. These places of shelter are rendered durable by their leaving one side of the tree felled, so that it continues growing with great luxuriance.

DIEMERBROEK (Ibrand), a learned professor of physic and anatomy at Utrecht, was born at Montfort, in Holland, in 1609, where he acquired great reputation by his lectures and his practice; and died at Utrecht in 1674. He wrote a treatise on the plague, which is esteemed; and several learned works in anatomy and medicine, which were printed at Utrecht in 1685, in folio.

DIEPPE, a handsome sea-port town of France, in Upper Normandy, in the territory of Caux; with a good harbour, an old castle, and two handsome moles. The parish-church of St James is an elegant structure; and there is a tower from which, in fine weather, the coast of England may be seen. The principal trade consists in herrings, whittings, mackerel, ivory, toys, and laces. It was bombarded by the English in 1694, and it is not now so considerable as it was formerly. It

is seated at the mouth of the river Argues, in E. Long. 1. 9. N. Lat. 49 55.

DIES MARCHIÆ, was the day of congress or meeting of the English and Scots, annually appointed to be held on the marches or borders, in order to adjust all differences between them.

DIESIS, in music, is the division of a tone less than a semitone; or an interval consisting of a less or imperfect semitone.

Diefs is the smallest and softest change or inflexion of the voice imaginable: it is called a *saint*, expressed thus X, by a St Andrew's cross or saltier.

DIESPITER, in antiquity, a name given to Jupiter; and signifying *dei pater*, "father of the day." St Augustin derives the name from *dies* "day," and *partus* "production, bringing forth;" it being Jupiter that brings forth the day. Of which sentiment were Servius and Macrobius; the former adding, that in the language of the Osci they called him *Lucentius*, as *Diespiter* in Latin.

DIET, in medicine, according to some, comprehends the whole regimen or rule of life with regard to the six non naturals; air, meats and drinks, sleep and watching, motion and rest, passions of the mind, retentions and excretions. Others restrain the term of diet to what regards eating and drinking, or solid aliments and drinks. See Food.

The natural constitution of the body of man is such, that it can easily bear some changes and irregularities without much injury. Had it been otherwise, we should be almost constantly put out of order by every slight cause. This advantage arises from those wonderful communications of the inward parts, whereby, when one part is affected, another comes immediately to its relief.

Thus, when the body is too full, nature causes evacuations through some of the outlets: and for this reason it is, that diseases from inanition are generally more dangerous than from repletion; because we can more expeditiously diminish than increase the juices of the body. Upon the same account, also, though temperance be beneficial to all men, the ancient physicians advised persons in good health, and their own masters, to indulge a little now and then, by eating and drinking more plentifully than usual. But, of the two, intemperance in drinking is safer than in eating: and if a person has committed excess in the latter, cold water drank upon a full stomach will help digestion; to which it will be of service to add lemon juice, or elixir of vitriol. If he has eaten high seasoned things, rich sauces, &c. then let him sit up for some little time, and afterwards sleep. But if a man happen to be obliged to fast, he ought to avoid all laborious work. From satiety it is not proper to pass directly to sharp hunger, nor from hunger to satiety: neither will it be safe to indulge absolute rest immediately after excessive labour, nor suddenly to fall to hard work after long idleness. In a word, therefore, all changes in the way of living should be made by degrees.

The softer and milder kinds of aliment are proper for children, and for youth the stronger. Old people ought to lessen the quantity of their food, and increase that of their drink: but yet some allowance is to be made for custom, especially in the colder climates like ours; for as in these the appetite is keener, so is the digestion

Diēt
||
Dieu.

digestion better performed. *Mead's Monita & Precepta.*

DIET-Drinks, a form in physic, including all the medicated wines, ales, and wheys, used in chronic cases. They require a course or continuation to answer any intention of moment.

DIET of Appearance, in Scots law, the day to which a defender is cited to appear in court; and every other day to which the court shall afterwards adjourn the consideration of the question.

DIET, or *Dyet*, in matters of policy, is used for the general assembly of the states or circles of the empire of Germany and of Poland, to deliberate and concert measures proper to be taken for the good of the public.

The general diet of the empire is usually held at Ratisbon. It consists of the emperor, the nine electors, and the ecclesiastical princes; viz. the archbishops, bishops, abbots, and abbesses; the secular princes, who are dukes, marquises, counts, viscounts, or barons; and the representatives of the imperial cities. It meets on the emperor's summons, and any of the princes may send their deputies thither in their stead. The diet makes laws, raises taxes, determines differences between the several princes and states, and can relieve the subjects from the oppressions of their sovereigns.

The diet of Poland, or the assembly of the states, consisted of the senate and deputies, or representative of every palatinate or county and city; and usually met every two years, and oftener upon extraordinary occasions, if summoned by the king, or, in his absence, by the archbishop of Gnesna. The general diet of Poland sat but six weeks, and often broke up in a tumult much sooner: for one dissenting voice prevented their passing any laws, or coming to any resolutions on what was proposed to them from the throne. Switzerland has also a general diet, which is usually held every year at Baden, and represents the whole Helvetic body: it seldom lasts longer than a month. Besides this general diet, there are diets of the Protestant cantons, and diets of the catholic ones: the first assemble at Araw, and are convoked by the canton of Zurich; the second at Lucern, convoked by the canton of that name.

DIETETIC, denotes something belonging to diet, but particularly that part of physic which treats of this subject. See *DIET*, *FOOD*, and *DRINK*.

DIETRICH, or *DIETRICH* (Christian William Ernest), a modern artist, who was born at Weimar in 1712. He resided chiefly at Dresden, where he was professor of the academy of arts. He was a painter of very extensive abilities, and succeeded both in history and landscape. We have by him a great number of small subjects, to the amount of 150 or more, which he engraved from his own compositions, in the style, says Basan, of Oshade of Lairelle, and of Salvator Rosa. Sixty of these etchings are exceedingly rare.

DIETS, a town in the circle of the Upper Rhine in Germany, situated on the river Lohn, twenty miles north of Mentz, and subject to the house of Nassau-Orange. E. Long. 7. 40. N. Lat. 50. 23.

DIEU ET MON DROIT, i. e. *God and my right*, the motto of the royal arms of England, first assumed by

king Richard I. to intimate that he did not hold his empire in vassalage of any mortal.

It was afterwards taken up by Edward III. and was continued without interruption to the time of the late king William, who used the motto *Je main tiendrai*, though the former was still retained upon the great seal. After him queen Anne used the motto *Semper eadem*, which had been before used by queen Elizabeth; but ever since queen Anne, *Dieu et mon droit* continues to be the royal motto.

DIFF, is the name of an instrument of music among the Arabs, serving chiefly to beat time to the voice: it is a hoop, sometimes with pieces of brass fixed to it to make a jingling, over which a piece of parchment is distended. It is beat with the fingers, and is the true *tympanum* of the ancients.

DIFFARRATION, among the Romans, a ceremony whereby the divorce of their priests was solemnized. The word comes from the preposition *dis*; which is used, in composition, for *division* or *separation*; and *farreatio*, a ceremony with wheat, of *far* "wheat."

Diffarreation was properly the dissolving of marriages contracted by consecration; which were those of the pontifices or priests. Festus says, it was performed with a wheaten cake. Vigenere will have consecration and diffarreation to be the same thing.

DIFFERENCE, in mathematics, is the remainder, when one number or quantity is subtracted from another.

DIFFERENCE, in logic, an essential attribute belonging to some species, and not found in the genus; being the idea that defines the species. Thus, body and spirit are the two species of substance, which in their ideas include something more than is included in the idea of substance. In body, for instance, is found impenetrability and extension; in spirit, a power of thinking and reasoning: so that the difference of body is impenetrable extension, and the difference of spirit is cogitation.

DIFFERENCE, in heraldry, a term given to a certain figure added to coats of arms, serving to distinguish one family from another; and to show how distant younger branches are from the elder or principal branch.

DIFFERENTIAL, *DIFFERENTIALE*, in the higher geometry, an infinitely small quantity, or a particle of quantity so small as to be less than any assignable one. It is called a *differential*, or *differential quantity*, because frequently considered as the difference of two quantities; and, as such, is the foundation of the *differential calculus*: Sir Isaac Newton, and the English, call it a *moment*, as being considered as the momentary increase of quantity. See *FLUXIONS*.

DIFORM, *DIFORMIS* (from *forma* "shape"), is a word used in opposition to *uniform*; and signifies, that there is no regularity in the form or appearance of a thing. The botanists use it as a distinction of the flowers of several species of plants.

DIFFUSE, an epithet applied to such writings as are wrote in a prolix manner. Among historians, Salust is reckoned sententious, and Livy diffuse. Thus also among the orators, Demosthenes is close and concise; Cicero, on the other hand, is diffuse.

DIFFUSION, the dispersion of the subtle effluvia of bodies into a kind of atmosphere all round them.

Thus

D. ff
||
Diffusion.

Digastrius Thus the light diffused by the rays of the sun, issues all round from that amazing body of fire.

Digest. DIGASTRICUS, in anatomy, a muscle of the lower jaw, called also *Bosenter*. See ANATOMY, *Table of the Muscles*.

DIGBY (Sir Kenelm), became very illustrious in the 17th century for his virtue and learning. He was descended of an ancient family in England. His great-grandfather, accompanied by six of his brothers, fought valiantly at Bosworth-field on the side of Henry VII. against the usurper Richard III. His father, Everard, suffered himself to be engaged in the gun-powder plot against king James I. and for that crime was beheaded. His son wiped off that stain, and was restored to his estate. King Charles I. made him gentleman of the bed-chamber, commissioner of the navy, and governor of the Trinity-house. He granted him letters of reprisal against the Venetians, by virtue whereof he took several prizes with a small fleet which he commanded. He fought the Venetians near the port of Scanderon, and bravely made his way through them with his booty. He was a great lover of learning, and translated several authors into English; and his "Treatise of the Nature of Bodies and the Immortality of the Soul," discovers great penetration and extensive knowledge. He applied to chemistry; and found out several useful medicines, which he gave freely away to people of all sorts, especially to the poor. He distinguished himself particularly by his sympathetic powder for the cure of wounds at a distance; his discourse concerning which made a great noise for a while. He had conferences with Des Cartes about the nature of the soul.

In the beginning of the civil wars, he exerted himself very vigorously in the king's cause; but he was afterwards imprisoned, by the parliament's order, in Winchester house, and had leave to depart thence in 1643. He afterwards compounded for his estate, but was ordered to leave the nation; when he went to France, and was sent on two embassies to pope Innocent X. from the queen, widow to Charles I. whose chancellor he then was. On the restoration of Charles II. he returned to London; where he died in 1665, aged 60.

This eminent person was, for the early pregnancy of his parts, and his great proficiency in learning, compared to the celebrated Picus de Mirandola, who was one of the wonders of human nature. His knowledge, though various and extensive, appeared to be greater than it really was; as he had all the powers of elocution and address to recommend it. He knew how to shine in a circle of ladies or philosophers; and was as much attended to when he spoke on the most trivial subjects, as when he spoke on the most important. It is said that one of the princes of Italy, who had no child, was desirous that his princefs should bring him a son by Sir Kenelm, whom he esteemed a just model of perfection.

DIGEST, DIGESTUM, a collection of the Roman laws, ranged and digested under proper titles, by order of the emperor Justinian.

That prince gave his chancellor Tribonianus a commission for this purpose; who, in consequence thereof, chose sixteen juriconsults, or lawyers, to work upon the same. These, accordingly, took out the best and

finest decisions from the two thousand volumes of the ancient juriconsults, and reduced them all into one body; which was published in the year 533, under the name of the *Digest*. To this the emperor gave the force of a law, by a letter at the head of the work, which serves it as a preface.

Digest makes the first part of the Roman law, and the first volume of the corpus or body of the civil law, contained in fifty books. It was translated into Greek under the same emperor, and called *Pandectæ*. See PANDECT.

Cujus says, that *Digest* is a common name for all books disposed in a good order and economy; and hence it is that Tertullian calls the Gospel of St Luke a *Digest*.

Hence also abridgements of the common law are denominated *digests* of the numerous cases, arguments, readings, pleadings, &c. dispersed in the year-books, and other reports and books of law, reduced under proper heads or common places. The first was that of Statham, which comes as low as Henry VI. That of Fitzherbert was published in 1564; Brook's in 1573, of which Hughes's, published in 1663, is a sequel. Rolls, Danvers, and Nelson, have also published *Digests* or abridgements of this kind, including the cases of later days; to which may be added the New Abridgement, Viner's Abridgement, &c.

DIGESTION, in the animal economy, is the dissolution of the aliments into such minute parts as are fit to enter the lacteal vessels, and circulate with the mass of blood. See ANATOMY, n° 102.

DIGESTION, in chemistry, is an operation which consists in exposing bodies to a gentle heat, in proper vessels, and during a certain time. This operation is very useful to favour the action of certain substances upon each other; as, for example, of well calcined, dry, fixed alkali upon rectified spirit of wine. When these two substances are digested together in a matrafs, with a gentle sand-bath heat, the spirit of wine acquires a yellow-reddish colour, and an alkaline quality. The spirit would not so well acquire these qualities by a stronger and shorter heat.

DIGESTIVE, in medicine, such remedies as strengthen and increase the tone of the stomach, and assist in the digestion of foods. To this class belong all stomachics and strengtheners or corroborants.

DIGESTIVE, in surgery, denotes a sort of unguent, plaster, or the like, that ripens and prepares the matter of wounds, &c. for suppuration.

DIGGING, among miners, is appropriated to the operation of freeing any kind of ore from the bed or stratum in which it lies, where every stroke of their tools turns to account: in contradistinction to the openings made in search of such ore, which are called *baiches*, or *essay-hatches*; and the operation itself, *tracing of miner*, or *hatching*.

When a bed of ore is discovered, the bee-men, so called from the instrument they use, which is a kind of pick-ax, free the ore from the fossils around it; and the shovel-men throw it up from one shamble to another, till it reaches the mouth of the hatch.

In some mines, to save the expence as well as fatigue of the shovel-men, they raise the ore by means of a winder and two buckets, one of which goes up as the other comes down.

Digestion
Digging.

Digit
||
Dignitary.

DIGIT, in astronomy, the twelfth part of the diameter of the sun or moon, used to express the quantity of an eclipse. Thus an eclipse is said to be of six digits, when fix of these parts are hid.

DIGITS, or *Monades*, in arithmetic, signify any integer under 10; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIGIT is also a measure taken from the breadth of the finger. It is properly $\frac{1}{4}$ ths of an inch, and contains the measure of four barley-corns laid breadthwise.

DIGITALIS, *fox-glove*: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 28th order, *Luride*. The calyx is quinquepartite; the corolla campanulate, quinquedid, and ventricose; the capsule ovate and bilocular.—There are six species; five of which are hardy, herbaceous, biennial, and perennial plants, and the sixth a tender shrubby exotic. The herbaceous species rise two or three feet high, crowned with spikes of yellow iron-coloured or purple flowers. The shrubby fort rises five or six feet high, having spear-shaped rough leaves, four or five inches long, and half as broad; the branches being all terminated with flowers growing in loose spikes. All the species are easily raised by seeds. An ointment made of the flowers of purple fox-glove and May-butter, is much commended by some physicians for feropulous ulcers which run much and are full of matter. Taken internally, this plant is a violent purgative and emetic; and is therefore only to be administered to robust constitutions. The country people in England frequently use a decoction of it with polydopy of the oak in epileptic fits. An infusion of two drams of the leaf in a pint of water, given in half-ounce doses every two hours or so, till it begin to puke or purge, is recommended in dropsy, particularly that of the breast. It is said to have produced an evacuation of water so copious and sudden, in ascites, by stool and urine, that the compression of bandages was found necessary. The plentiful use of diuretics is ordered during its operation. The remedy, however, is inadmissible in very weakly patients. But besides being given in infusion, it has also been employed in substance. And when taken at bed-time to the extent of one, two, or three, grains of the dried powder, it often in a short time operates as a very powerful diuretic, without producing any other evacuation. Even this quantity, however, will sometimes excite very severe vomiting, and that too occurring unexpectedly. During its operation it has often very remarkable influence in rendering the pulse slower; and it frequently excites very considerable vertigo, and an affection of vision. Fox-glove has of late also been employed in some instances of hæmoptysis, of phthisis, and of mania, with apparent good effects: but its use in these diseases is much less common than in dropsy.

DIGITATED, among botanists. See **BOTANY**, p. 445, n° 270, and Plate CV. fig. 102.

DIGLYPH, in architecture, a kind of imperfect triglyph, console, or the like; with two channels or engravings, either circular or angular.

DIGNE, an episcopal town of Provence in France, famous for the baths that are near it. It is seated on a river called Maderic, in E. Long. 5. 27. N. Lat. 44. 45.

DIGNITARY, in the canon law, a person who

N° 101.

holds a dignity, that is, a benefice which gives him some pre-eminence over mere priests and canons. Such is a bishop, dean, arch deacon, prebendary, &c.

DIGNITY, as applied to the titles of noblemen, signifies honour and authority. And dignity may be divided into superior and inferior; as the titles of duke, earl, baron, &c. are the highest names of dignity; and those of baronet, knight, squire, at law, &c. the lowest. Nobility only can give so high a name of dignity as to supply the want of a surname in legal proceedings; and as the omission of a name of dignity may be pleaded in abatement of a writ, &c. so it may be where a peer who has more than one name of dignity, is not named by the Most Noble. No temporal dignity of any foreign nation can give a man a higher title here than that of **ESQUIRE**.

DIGNITY, in the human character, the opposite of *Meaness*.

Man is endued with a **SENSE** of the worth and excellence of his nature: he deems it more perfect than that of the other beings around him; and he perceives that the perfection of his nature consists in virtue, particularly in virtues of the highest rank. To express that sense, the term *dignity* is appropriated. Further, to behave with dignity, and to refrain from all mean actions, is felt to be, not a virtue only, but a duty: it is a duty every man owes to himself. By acting in that manner, he attracts love and esteem: by acting meanly, or below himself, he is disapproved and contemned.

This sense of the dignity of human nature reaches even our pleasures and amusements. If they enlarge the mind by raising grand or elevated emotions, or if they humanize the mind by exercising our sympathy, they are approved as suited to the dignity of our nature: if they contract the mind by fixing it on trivial objects, they are condemned as not suited to the dignity of our nature. Hence, in general, every occupation, whether of use or amusement, that corresponds to the dignity of man, is termed *manly*; and every occupation below his nature, is termed *childish*.

To those who study human nature, there is a point which has always appeared intricate: How comes it that generosity and courage are more esteemed, and bestow more dignity, than good-nature, or even justice; though the latter contribute more than the former to private as well as to public happiness? This question, bluntly proposed, might puzzle even a philosopher; but, by means of the foregoing observations, will easily be solved. Human virtues, like other objects, obtain a rank in our estimation, not from their utility, which is a subject of reflection, but from the direct impression they make on us. Justice and good-nature are a sort of negative virtues, that scarce make any impression but when they are transgressed: courage and generosity, on the contrary, producing elevated emotions, enliven greatly the sense of a man's dignity, both in himself and in others; and for that reason, courage and generosity are in higher regard than the other virtues mentioned: we describe them as grand and elevated, as of greater dignity, and more praise-worthy.

This leads us to examine more directly emotions and passions with respect to the present subject: and it will not be difficult to form a scale of them, beginning with the

Dignity.

Dignity.

the meanest, and ascending gradually to those of the highest rank and dignity. Pleasure felt as at the organ of sense, named *corporeal pleasure*, is perceived to be low; and when indulged to excess, is perceived also to be mean: for that reason, persons of any delicacy dissemble the pleasure they take in eating and drinking. The pleasures of the eye and ear, having no organic feeling, and being free from any sense of meanness, are indulged without any shame: they even rise to a certain degree of dignity when their objects are grand or elevated. The fame is the case of the sympathetic passions: a virtuous person behaving with fortitude and dignity under cruel misfortunes, makes a capital figure; and the sympathetic spectator feels in himself the same dignity. Sympathetic distress at the same time never is mean: on the contrary, it is agreeable to the nature of a social being, and has general approbation. The rank that love possesses in the scale, depends in a great measure on its object: it possesses a low place when founded on external properties merely; and is mean when bestowed on a person of inferior rank without any extraordinary qualification: but when founded on the more elevated internal properties, it assumes a considerable degree of dignity. The fame is the case of friendship. When gratitude is warm, it animates the mind; but it scarce rises to dignity. Joy bestows dignity when it proceeds from an elevated cause.

If we can depend upon induction, dignity is not a property of any disagreeable passion: one is slight, another severe; one depresses the mind, another animates it; but there is no elevation, far less dignity, in any of them. Revenge, in particular, though it enflame and swell the mind, is not accompanied with dignity, not even with elevation: it is not however felt as mean or grovelling, unless when it takes indirect measures for gratification. Shame and remorse, though they sink the spirits, are not mean. Pride, a disagreeable passion, bestows no dignity in the eye of a spectator. Vanity always appears mean; and extremely so where founded, as commonly happens, on trivial qualifications.

We proceed to the pleasures of the understanding, which possess a high rank in point of dignity. Of this every one will be sensible, when he considers the important truths that have been laid open by science; such as general theorems, and the general laws that govern the material and moral worlds. The pleasures of the understanding are suited to man as a rational and contemplative being, and they tend not a little to ennoble his nature; even to the Deity he stretcheth his contemplations, which, in the discovery of infinite power, wisdom, and benevolence, afford delight of the most exalted kind. Hence it appears, that the fine arts, studied as a rational science, afford entertainment of great dignity; superior far to what they afford as a subject of taste merely.

But contemplation, however in itself valuable, is chiefly respected as subservient to action; for man is intended to be more an active than a contemplative being. He accordingly shows more dignity in action than in contemplation: generosity, magnanimity, heroism, raise his character to the highest pitch: these best express the dignity of his nature, and advance

him nearer to divinity than any other of his attributes.

Having endeavoured to assign the efficient cause of dignity and meanness, by unfolding the principle on which they are founded, we proceed to explain the final cause of the dignity or meanness bestowed upon the several particulars above mentioned, beginning with corporeal pleasures. These, as far as useful, are, like justice, fenced with sufficient fancies to prevent their being neglected: hunger and thirst are painful sensations; and we are incited to animal love by a vigorous propensity: were corporeal pleasures dignified over and above with a place in a high class, they would infallibly overturn the balance of the mind, by outweighing the social affections. This is a satisfactory final cause for refusing to these pleasures any degree of dignity: and the final cause is not less evident of their meanness when they are indulged to excess. The more refined pleasures of external sense, conveyed by the eye and the ear from natural objects and from the fine arts, deserve a high place in our esteem, because of their singular and extensive utility: in some cases they rise to a considerable dignity; and the very lowest pleasures of the kind are never esteemed mean or grovelling. The pleasure arising from wit, humour, ridicule, or from what is simply ludicrous, is useful, by relaxing the mind after the fatigue of more manly occupation: but the mind, when it surrenders itself to pleasure of that kind, loses its vigour, and sinks gradually into sloth. The place this pleasure occupies in point of dignity, is adjusted to these views: to make it useful as a relaxation, it is not branded with meanness; to prevent its usurpation, it is removed from that place but a single degree: no man values himself for that pleasure, even during gratification; and if it have engrossed more of his time than is requisite for relaxation, he looks back with some degree of shame.

In point of dignity, the social emotions rise above the selfish, and much above those of the eye and ear: man is by his nature a social being; and to qualify him for society, it is wisely contrived, that he should value himself more for being social than selfish.

The excellency of man is chiefly discernible in the great improvements he is susceptible of in society: these, by perseverance, may be carried on progressively, above any assignable limits; and even abstracting from revelation, there is great probability, that the progress begun here will be completed in some future state. Now, as all valuable improvements proceed from the exercise of our rational faculties, the Author of our nature, in order to excite us to a due use of these faculties, hath assigned a high rank to the pleasures of the understanding: their utility, with respect to this life as well as a future, intitles them to that rank.

But as action is the aim of all our improvements, virtuous actions justly possess the highest of all the ranks. These, we find, are by nature distributed into different classes, and the first in point of dignity assigned to actions that appear not the first in point of use: generosity, for example, in the sense of mankind is more respected than justice, though the latter is undoubtedly more essential to society; and magnanimity,

Dignity.

Dignity
Dii.

heroism, undaunted courage, rise still higher in our esteem : The reason of which is explained above.

DIGNITY, in oratory, is one of the three parts of general elocution; and consists in the right use of tropes and figures. See **ORATORY**, n° 48.

DIGON, an ancient, handsome, rich, and very considerable town of France; capital of Burgundy, and of the Digonois; with a parliament, bishop's see, a mint, an university, academy of sciences, an abbey, and a citadel : most part of the churches and public structures are very beautiful, and in one of the squares there is an equestrian statue of Louis XIV. It is seated in a very pleasant plain between two small rivers, which produces excellent wine. E. Long. 5. 7. N. Lat. 47. 10.

DIGRESSION, in oratory, is defined by Quintilian, agreeably to the etymology of the word, to be, a going off from the subject we are upon to some different thing, which, however, may be of service to it. See **ORATORY**, n° 37.

DIGYNIA, (from *dic* twice, and *gyn* a woman), the name of an order or secondary division in each of the first 13 classes, except the 9th, in Linnæus's sexual method; consisting of plants, which to the classic character, whatever it is, add the circumstance of having two styles or female organs.

DII, the divinities of the ancient inhabitants of the earth, were very numerous. Every object which caused terror, inspired gratitude, or bestowed assistance, received the tribute of veneration. Man saw a superior agent in the stars, the elements, or the trees, and supposed that the waters which communicated fertility to his fields and possessions, were under the influence and direction of some invisible power inclined to favour and to benefit mankind. Thus arose a train of divinities which imagination arrayed in different forms, and armed with different powers. They were endowed with understanding, and were actuated by the same passions which daily afflict the human race, and those children of superstition were appeased or provoked as the imperfect being which gave them birth. Their wrath was mitigated by sacrifices and incense, and sometimes human victims bled to expiate a crime, which superstition alone supposed to exist. The sun, from his powerful influence and animating nature, first attracted the notice and claimed the adoration of the uncivilized inhabitants of the earth. The moon also was honoured with sacrifices and addressed in prayers, and after immortality had been liberally bestowed on all the heavenly bodies, mankind classed among their deities the brute creation, and the cat and the sow shared equally with Jupiter himself, the father of gods and men, the devout veneration of their votaries. This immense number of deities have been divided into different classes according to the will and pleasure of the mythologists. The Romans, generally speaking, reckoned two classes of the gods, the *dii majorum gentium*, or *dii consules*, and the *dii minorum gentium*. The former were 12 in number, six males and six females. [*Vid. CONSENSUS.*] In the class of the latter were ranked all the gods which were worshipped in different parts of the earth. Besides these there were some called *dii selæti*, sometimes classed with the 12 greater gods; these were Janus, Saturn, the Genius, the Moon, Pluto, and Bacchus. There were also some

called demi-gods, that is, who deserved immortality by the greatness of their exploits, and for their uncommon services to mankind. Among these were Priapus, Vertumnus, Hercules, and those whose parents were some of the immortal gods. Besides these, all the passions and the moral virtues were reckoned as powerful deities, and temples were raised to a goddess of concord, peace, &c. According to the authority of Hesiod, there were no less than 30,000 gods that inhabited the earth, and were guardians of men, all subservient to the power of Jupiter. To these, succeeding ages have added an almost equal number; and indeed they were so numerous, and their functions so various, that we find temples erected, and sacrifices offered, to unknown gods. It is observable, that all the gods of the ancients have lived upon earth as mere mortals; and even Jupiter, who was the ruler of heaven, is represented by the mythologists as a helpless child; and we are acquainted with all the particulars that attended the birth and education of Juno. In process of time, not only good and virtuous men, who had been the patrons of learning and the supporters of liberty, but also thieves and pirates, were admitted among the gods, and the Roman senate courteously granted immortality to the most cruel and abandoned of their emperors.

DIJAMBUS, in poetry, the foot of a Latin verse of four syllables; it is compounded of two iambs, as *se-ver-nus*.

DIKE, a ditch or drain, made for the passage of waters.—The word seems formed from the verb *to dig*; tho' others choose to derive it from the Dutch, *dijk*, a dam, sea-bank, or wall.

DIKE, or *Dyke*, also denotes a work of stone, timber or fascines, raised to oppose the entrance or passage of the waters of the sea, a river, lake, or the like.—The word comes from the Flemish *dyk*, or *dijk*, a heap of earth to bound or stem the water. Junius and Menage take the Flemish to have borrowed their word from the Greek *μαχη*, wall. Guichard derives it from the Hebrew *daghab*. These dikes are usually elevations of earth, with hurdles of stakes, stones, and other matters.

The dike of Rochelle is made with vessels fastened to the bottom. The dikes of Holland are frequently broke through, and drown large tracts of land.

DILAPIDATION, in law, a wasteful destroying or letting buildings, especially parsonage-houses, &c. run to decay, for want of necessary reparation. If the clergy neglect to repair the houses belonging to their benefices, the bishop may sequester the profits thereof for that purpose. And in these cases, a prosecution may be brought either in the spiritual court or at common law, against the incumbent himself, or against his executor or administrator.

DILATATION, in physics, a motion of the parts of any body, by which it is so expanded as to occupy a greater space. This expansive motion depends upon the elastic power of the body; whence it appears that dilatation is different from rarefaction, this last being produced by the means of heat.

DILATATOIRES, in anatomy, a name given to several muscles in the human body. See **ANATOMY**, *Table of the Muscles*.

DILATORY PLEAS, in law, are such as are put

Dilatoris in merely for delay; and there may be a demurrer to a dilatory plea; or the defendant shall be ordered to plead better, &c. The truth of dilatory pleas is to be made out by affidavit of the fact, &c. by stat. 4 and 5 Anne. See **PLEA**.

DILATRIS, in botany: A genus of the monogynia order, belonging to the triandria class of plants. There is no calyx; the corolla has six petals, and is shaggy; the stigma simple.

DILEMMA, in logic, an argument equally conclusive by contrary suppositions. See **LOGIC**.

DILIGENCE, in Scots law, signifies either that care and attention which parties are bound to give, in implementing certain contracts or trusts, and which varies according to the nature of the contract; as to which, see **LAW**, N° clxi. 12, 13. clxxiii. 8. & clxxxi. 18. Or it signifies certain forms of law, whereby the creditor endeavours to operate his payment, either by affecting the person or estate of the debtor; *ibid.* N° clxxi. clxxii.

DILL, in botany. See **ANETHUM**.

DILLEMBURG, a town of Germany, in Wetteravia, and capital of a county of the same name. It is subject to a prince of the house of Nassau, and is situated in E. Long. 8. 24. N. Lat. 50. 45.

DILLENGEN, a town of Germany, in the circle of Suabia, with an university, and where the bishop of Augsburg resides. It is seated near the Danube, in E. Long. 11. 35. N. Lat. 48. 38.

DILLENIA, in botany, a genus of the polygynia belonging to the polyandria class of plants. The calyx is pentaphyllous; the petals five; the capsules numerous, polyspermous, coalited, and full of pulp.

DILUTE. To dilute a body is to render it liquid; or, if it were liquid before, to render it more so, by the addition of a thinner thereto. These things thus added are called *diluents*, or *dilutors*.

DIMACHÆ, (from *dis*, double, and *μαχο* I fight,) in antiquity, a kind of ornament, first instituted by Alexander. Their armour was lighter than that of the infantry, and at the same time heavier than that used by horsemen, so that they could act as horse or foot as occasion required.

DIMENSION, in geometry, is either length, breadth, or thickness; hence, a line hath one dimension, *viz.* length; a superficies two, *viz.* length and breadth; and a body, or solid, has three, *viz.* length, breadth, and thickness.

DIMINUTION, in architecture, a contraction of the upper part of a column, by which its diameter is made less than that of the lower part*.

DIMINUTIVE, in grammar, a word formed from some other, to soften or diminish the force of it, or to signify a thing is little in its kind. Thus, *cellule* is a diminutive of *cell*, globe of globe, hillock of hill.

DIMISSORY LETTERS, *Litteræ Dimissoriae*, in the canon law, a letter given by a bishop to a candidate for holy orders, having a title in his diocese, directed to some other bishop, and giving leave for the bearer to be ordained by him.

When a person produces letters of ordination or tonsure, conferred by any other than his own diocesan, he must at the same time produce the letters dimissory given by his own bishop, on pain of nullity.

Letters dimissory cannot be given by the chapter, *Dimissoriae sede vacante*; this being deemed an act of voluntary jurisdiction, which ought to be referred to the successor.

DIMERITÆ, a name given to the Apollinarists, who at first held, that the word only assumed a human body, without taking a reasonable soul like ours; but being at length convinced by formal texts of scripture, they allowed, that he did assume a soul, but without understanding; the word supplying the want of that faculty. From this way of separating the understanding from the soul, they became denominated *dimeritæ*, q. d. *dividers, separators*, of *divis* and *meritæ*, I divide.

DINDYMA-ORUM, (Virgil,) from *Dindymus*-i; a mountain allotted by many to Phrygia. Strabo has two mountains of this name; one in Mysia near Cyzicus; the other in Gallograecia near Pessinus; and none in Phrygia. Ptolemy extends this ridge from the borders of Troas, through Phrygia to Gallograecia: though therefore there were two mountains called *Dindymus* in particular, both sacred to the mother of the gods, and none of them in Phrygia Major; yet there might be several hills and eminences in it, on which this goddess was worshipped, and therefore called *Dindyma* in general. Hence Cybele is surnamed *Dindymene*, (Horace.)

DINGWAL, a parliament-town of Scotland in the shire of Ross, seated on the frith of Cromarty, 15 miles west of the town of Cromarty. Near it runs the river Conel, famous for producing pearls. W. Long. 4. 15. N. Lat. 57. 45. Dingwal was a Scotch barony in the person of the duke of Ormond in right of his lady, but forfeited in 1715.

DINNER, the meal taken about the middle of the day.—The word is derived from the French *dîner*, which Du Cange derives from the barbarous Latin *disinare*. Henry Stephens derives it from the Greek *δινειν*; and will have it wrote *dignier*. Menage deduces it from the Italian *desinare*, “to dine”; and that from the Latin *desinere*, “to leave off work.”

It is generally agreed to be the most salutary to make a plentiful dinner, and to eat sparingly at supper. This is the general practice among us. The French, however, in imitation of the ancient Romans, defer their good cheer to the evening; and Bernardinus Paternus, an eminent Italian physician, maintains it to be the most wholesome method, in a treatise expressly on the subject.

The grand Tartar emperor of China, after he has dined, makes publication by his heralds, that he gives leave for all the other kings and potentates of the earth to go to dinner; as if they waited for his leave.

DINOCRATES, a celebrated architect of Macedonia, who rebuilt the temple of Ephefus, when burnt by Erostratus, with much more magnificence than before. Vitruvius informs us that Dinocrates proposed to Alexander the Great to convert mount Athos into the figure of a man, whose left hand should contain a walled city, and all the rivers of the mount flow into his right, and from thence into the sea! He also conceived a scheme for building the dome of the temple of Arsinoe at Alexandria, of loadstone; that should by its attraction uphold her iron image in the centre, suspended in the air! Projects which at least showed a vast extent of imagination.

* See *Arbitrarius*, n° 38.

Dio
||
Diocleia.

DIO CHRYSOSTOM that is, *Golden Mouth*, a celebrated orator and philosopher of Greece, in the first century, was born at Prusa in Bithynia. He attempted to persuade Vespasian to quit the empire; was hated by Domitian; but acquired the esteem of Trajan. This last prince took pleasure in conversing with him, and made him ride with him in his triumphal chariot. There are still extant, 80 of Dio's orations, and some other of his works: the best edition of which is that of Hermand Samuel Raimarus, in 1750, in folio.

DIOCESE, or DIOCESS, the circuit or extent of the jurisdiction of a Bishop.—The word is formed from the Greek *διοικησις*, government, administration; formed of *διοικω*, which the ancient glossaries render *administro*, *moderor*, *ordino*: hence *διοικησις* the *οικονομία*, the administration or government of a city.

DIOCESE is also used in ancient authors, &c. for the province of a METROPOLITAN.

Dioceses, *διοικησεις*, was originally a civil government, or prefecture, composed of divers provinces.

The first division of the empire into dioceses is ordinarily ascribed to Constantine; who distributed the whole Roman state into four, viz. the diocese of Italy, the diocese of Illyria, that of the east, and that of Africa. And yet, long before Constantine, Strabo, who wrote under Tiberius, takes notice, lib. xiii. p. 432. that the Romans had divided Asia into dioceses; and complains of the confusion such a division occasioned in geography, Asia being no longer divided by people, but by dioceses, each whereof had a tribunal or court, where justice was administered. Constantine, then, was only the institutor of those large dioceses, which comprehended several metropolises and governments; the former dioceses only comprehending one jurisdiction or district, or the country that had resort to one judge, as appears from this passage in Strabo, and (before Strabo) from Cicero himself, lib. iii. *epist. ad famil.* 9. and lib. xiii. *ep.* 67.

Thus, at first a province included divers dioceses; and afterwards a diocese came to comprise divers provinces. In after times the Roman empire became divided into 13 dioceses or prefectures; though, including Rome, and the suburbicary regions, there were 14. These 14 dioceses comprehended 120 provinces: each province had a proconsul, who resided in the capital or metropolis; and each diocese of the empire had a consul, who resided in the principal city of the district.

On this civil constitution, the ecclesiastical one was afterwards regulated: each diocese had an ecclesiastical vicar or primate, who judged finally of all the concerns of the church within his territory.

At present there is some further alteration: for diocese does not now signify an assemblage of divers provinces; but is limited to a single province under a metropolitan, or more commonly to the single jurisdiction of a bishop.

Gul. Brito affirms diocese to be properly the territory and extent of a baptismal or parochial church; whence divers authors use the word to signify a simple parish. See PARISH.

DIOCLEIA, *Διοκλεία*, in antiquity, a solemnity kept in the spring at Megara, in memory of the Athenian hero, who died in the defence of the youth he loved.

Diocle-
sius
||
Diodon.

DIOCLESIANUS (Caius Valerius Jovius), a celebrated Roman emperor born of an obscure family in Dalmatia in 245. He was first a common soldier, and by merit and success he gradually rose to the office of a general; and at the death of Numerian in 284 he was invested with imperial power. In this high station he rewarded the virtues and fidelity of Maximian, who had shared with him all the subordinate offices in the army, by making him his colleague on the throne. He created two subordinate emperors Constantius and Galerius, whom he called Cæsars, whilst he claimed for himself and his colleague the superior title of Augustus. Dioclesian has been celebrated for his military virtues; and though he was naturally unpolished by education and study, yet he was the friend and patron of learning and true genius. He was bold and resolute, active and diligent, and well acquainted with the arts, which will endear a sovereign to his people, and make him respectable even in the eyes of his enemies. His cruelty, however, against the followers of Christianity, has been deservedly branded with infamy. After he had reigned 22 years in the greatest prosperity, he publicly abdicated the crown at Nicomedia in 305, and retired to a private station at Salona. Maximian his colleague followed his example, but not from voluntary choice; and when he some time after endeavoured to rouse the ambition of Dioclesian, and persuade him to re-assume the imperial purple, he received for answer, that Dioclesian took now more delight in cultivating his little garden than he formerly enjoyed in a palace, when his power was extended over all the earth. He lived nine years after his abdication in the greatest security and enjoyment at Salona, and died in 314, in the 68th year of his age. Dioclesian is the first sovereign who voluntarily resigned his power. His bloody persecution of the Christians forms a chronological era, called the *era of Dioclesian*, or of the martyrs. It was for a long time in use in theological writings, and is still followed by the Copts and Abyssinians. It commenced August 29. 284.

DIOCAHEDRIA, in natural history, a genus of pellucid and crystalliform spars, composed of two octangular pyramids, joined base to base, without any intermediate column. Of these some have long pyramids, others short and sharp-pointed ones, and others short and obtuse-pointed ones; the two former species being found in the Hartz-forest, and the last in the mines of Cornwall.

DIODATI (John), a famous minister, and professor of theology at Geneva, was born at Lucca in 1579, and died at Geneva in 1652. He is distinguished by translations, 1. of the Bible into Italian, with notes, Geneva 1607, 4to. The best edition at Geneva in 1641, folio. This is said to be more a paraphrase than a translation, and the notes rather divine meditations than critical reflections. 2. Of the Bible into French, Geneva, 1644. 3. Of Father Paul's History of the Council of Trent into French.

DIODIA, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 47th order, *Stellate*. The corolla is monopetalous and funnel-shaped; the capsule bilocular and dispermous.

DIODON, or SUN-FISH, in ichthyology, a genus belonging to the order of amphibia nantes.

There

Birds,
Diodorus.

There are three species. 1. The oblong sun-fish grows to a great bulk: one examined by Sylvianus was above 100 pounds in weight; and Dr Borlase mentions another taken at Plymouth in 1734, that weighed 500. In form it resembles a bream or some deep fish cut off in the middle. The mouth is very small, and contains in each jaw two broad teeth, with sharp edges. The eyes are little; before each is a small femilunar aperture; the pectoral fins are very small, and placed behind them. The colour of the back is dusky, and dappled; the belly silvery: between the eyes and the pectoral fins are certain streaks pointing downwards. The skin is free from scales.

When boiled, it has been observed to turn into a glutinous jelly, resembling boiled starch when cold, and served the purposes of glue on being tried on paper and leather. The meat of this fish is uncommonly rank: it feeds on shell-fish.

There seems to be no satisfactory reason for the old English name. Care must be taken not to confound it with the sun-fish of the Irish (see *SQUALUS*), which differs in all respects from this.

2. The mola, or short sun-fish, differs from the former, in being much shorter and deeper. The back and the anal fins are higher, and the aperture to the gills not femilunar, but oval. The situation of the fins are the same in both.

Both kinds are taken on the western coasts of this kingdom, but in much greater numbers in the warmer parts of Europe.—Mr Brunnich informs us, that between Antibes and Genoa he saw one of this species lie asleep on the surface of the water: a sailor jumped overboard and caught it.

See Plate
CLXIV.

3. The levigatus, or globe, is common to Europe and South Carolina. As yet only a single specimen has been discovered in our seas; taken at Penzance in Cornwall. The length was one foot seven: the length of the belly, when distended, one foot; the whole circumference in that situation two feet six. The form of the body is usually oblong; but when alarmed, it has the power of inflating the belly to a globular shape of great size. This seems designed as a means of defence against fish of prey: as they have less means of laying hold of it; and are besides terrified by the numbers of spines with which that part is armed, and which are capable of being erected on every part. The mouth is small: the irides white, tinged with red: the back from head to tail almost straight, or at least very slightly elevated; of a rich deep blue colour. It has the pectoral, but wants the ventral fins: the tail is almost even, divided by an angular projection in the middle; tail and fins brown. The belly and sides are white, shagreened or wrinkled; and beset with innumerable small sharp spines, adhering to the skin by four processes.

DIODORUS, an historian, surnamed *Siculius*, because he was born at Agrigra in Sicily. He wrote an history of Egypt, Persia, Syria, Media, Greece, Rome, and Carthage; and it is said that he visited all the places of which he has made mention in his history. It was the labour of 30 years. He is, however, too credulous in some of his narrations; and often wanders far from the truth. He often dwells too long upon fabulous reports and trifling incidents; while events of the greatest importance to history are treated with brevity, and sometimes passed over in silence. He lived

in the age of J. Cæsar and Augustus; and spent much time at Rome to procure information, and authenticate his historical narrations. This important work, which he composed in Greek, contained 40 books, of which there are only 15 remaining. The style is clear and neat, and very suitable to history. The best edition is that of Amsterdam, 1743, in 2 vols folio.

DIOECIA, (from *diœ* twice, and *oecia* a house or habitation) two houses. The name of the 22d class in Linnæus's sexual method, consisting of plants, which having no hermaphrodite flowers, produce male and female flowers on separate roots. These latter only ripen seeds; but require for that purpose, according to the sexualists, the vicinity of a male plant; or the asperion, that is, sprinkling, of the male dust. From the seeds of the female flowers are raised both male and female plants. The plants then in the class diecia are all male and female; not hermaphrodite, as in the greater number of classes; nor with male and female flowers upon one root, as in the class monœcia of the same author. See BOTANY, p. 430.

DIOGENES of Apollonia, in the island of Crete, held a considerable rank among the philosophers who taught in Ionia before Socrates appeared at Athens. He was the scholar and successor of Anaximenes, and in some measure rectified his master's opinion concerning air being the cause of all things. It is said, that he was the first who observed that air was capable of condensation and rarefaction. He passed for an excellent philosopher, and died about the 450th year before the Christian era.

DIOGENES the Cynic, a famous philosopher, was the son of a banker of Sinope in Pontus. Being banished with his father for coining false money, he retired to Athens, where he studied philosophy under Antisthenes. He added new degrees of austerity to the sect of the Cynics, and never did any philosopher carry so far a contempt for the conveniences of life. He was one of those extraordinary men who run every thing to extremity, without excepting even reason itself; and who confirm the saying, that "there is no great genius without a tincture of madness." He lodged in a tub; and had no other moveables besides his staff, wallet, and wooden bowl, which last he threw away on seeing a boy drink out of the hollow of his hand. He used to call himself a vagabond, who had neither house nor country; was obliged to beg, was ill clothed, and lived from hand to mouth; and yet, says Ælian, he took as much pride in these things as Alexander could in the conquest of the world. He was not indeed a jot more humble than those who are clothed in rich apparel, and fare sumptuously every day. He looked down on all the world with scorn; he magisterially censured all mankind, and thought himself unquestionably superior to all other philosophers. Alexander one day paid him a visit, and made him an offer of riches or any thing else: but all that the philosopher requested of him was, to stand from betwixt the sun and him. As if he had said, "Do not deprive me of the benefits of nature, and I leave to you those of fortune." The conqueror was so affected with the vigour and elevation of his soul, as to declare, that "if he was not Alexander, he would chuse to be Diogenes:" that is, if he was not in possession of all that was pompous and splendid in life, he would, like Diogenes, heroically despise it. Diogenes.

Diecia,
Diogenes.

Diogenes. Diogenes had great preface of mind, as appears from his smart sayings and quick repartees; and Plato seems to have hit off his true character when he called him a Socrates run mad. He spent a great part of his life at Corinth, and the reason of his living there was as follows: As he was going over to the island of Ægina, he was taken by pirates, who carried him into Crete, and there exposed him to sale. He answered the crier, who asked him what he could do, that "he knew how to command men;" and perceiving a Corinthian who was going by, he showed him to the crier, and said, "Sell me to that gentleman, for he wants a master." Xenias, for that was the Corinthian's name, bought Diogenes, and carried him with him to Corinth. He appointed him tutor to his children, and entrusted him also with the management of his house. Diogenes's friends being desirous of redeeming him, "You are fools, (said he); the lions are not the slaves of those who feed them, but they are the servants of the lions." He therefore plainly told Xenias, that he ought to obey him, as people obey their governors and physicians. Some say, that Diogenes spent the remainder of his life in Xenias's family; but Dion Chrysostom asserts that he passed the winter at Athens, and the summer at Corinth. He died at Corinth when he was about 90 years old: but authors are not agreed either as to the time or manner of his death. The following account, Jerom says, is the true one. As he was going to the Olympic games, a fever seized him in the way; upon which he lay down under a tree, and refused the assistance of those who accompanied him, and who offered him either a horse or a chariot. "Go you to the games, (says he), and leave me to contend with my illness. If I conquer, I will follow you: If I am conquered, I shall go to the shades below." He dispatched himself that very night; saying, that "he did not so properly die, as get rid of his fever." He had for his disciples Onesicritus, Phocion, Silpo of Megara, and several other great men. His works are lost.

DIODES Laertius, so called from Laerta in Cilicia where he was born, an ancient Greek author, who wrote ten books of the Lives of the Philosophers, still extant. In what age he flourished, is not easy to determine. The oldest writers who mention him are Socrates Alexandrinus, who lived in the time of Constantine the Great, and Hefychius Milesius, who lived under Justinian. Diogenes often speaks in terms of approbation of Plutarch and Phavorinus; and therefore, as Plutarch lived under Trajan, and Phavorinus under Hadrian, it is certain that he could not flourish before the reigns of those emperors. Menage has fixed him to the time of Severus; that is, about the year of Christ 200. From certain expressions in him some have fancied him to have been a Christian; but, as Menage observes, the immoderate praises he bestows upon Epicurus will not suffer us to believe this, but incline us rather to suppose that he was an Epicurean. He divided his Lives into books, and inscribed them to a learned lady of the Platonic school, as he himself intimates in his life of Plato. Montaigne was so fond of this author, that instead of one Laertius he wishes we had a dozen; and Vossius says, that his work is as precious as gold. Without doubt we are greatly obliged to him for what we know of the ancient philoso-

phers; and if he had been as exact in the writing part, as he was judicious in the choice of his subject, we had been more obliged to him still. Bishop Burnet, in the preface to his Life of Sir Matthew Hale, speaks of him in the following proper manner: "There is no book the ancients have left us (says he), which might have informed us more than Diogenes Laertius's Lives of the Philosophers, if he had had the art of writing equal to that great subject which he undertook: for if he had given the world such an account of them as Gassendus has done of Peiresc, how great a stock of knowledge might we have had, which by his unskilfulness is in a great measure lost? since we must now depend only on him, because we have no other and better author who has written on that argument." There have been several editions of his Lives of the Philosophers; but the best is that printed in two volumes 4to, at Amsterdam, 1693. This contains the advantages of all the former, besides some peculiar to itself: the Greek text and the Latin version corrected and amended by Meibomius; the entire notes of Henry Stephens, both the Casaubons, and of Menage; 24 copper-plates of philosophers elegantly engraved: to which is added, The History of the Female Philosophers, written by Menage, and dedicated to Madam Dacier. Besides this, Laertius wrote a book of Epigrams upon illustrious Men, called Pammetrus, from its various kinds of metre: but this is not extant.

DIOMEDIA, in ornithology, a genus belonging to the order of anseres. The bill is straight; the superior mandible is crooked at the point, and the lower one is truncated; the nostrils are oval, open, a little prominent, and placed on the sides. There are two species, viz. 1. The exulans, has pennated wings, and three toes on each foot. It is the albatross of Edwards; and is about the size of a pelican. These birds are found in the ocean betwixt the tropics and at the Cape of Good Hope. They are also often seen in vast flocks in Kamtschatka, and adjacent islands, about the end of June, where they are called *Great Gulls*; but it is chiefly in the bay of Penschineski, the whole inner sea of Kamtschatka, the Kurile isles, and that of Bering; for on the eastern coasts of the first they are scarce, a single straggler only appearing now and then. Their chief motive for frequenting these places seems to be plenty of food; and their arrival is a sure preface of shoals of fish following. At their first coming they are very lean, but soon grow immensely fat. Are very voracious birds, and will often swallow a salmon of four or five pounds weight; but as they cannot take the whole of it into their stomach at once, part of the tail end will often remain out of the mouth; and the natives, finding the bird in this situation, make no difficult matter of knocking it on the head on the spot. Before the middle of August they migrate elsewhere. They are often taken by means of a hook baited with a fish; but it is not for the sake of their flesh that they are valued, it being hard and unfavoury, but on account of the intestines, a particular part of which they blow up as a bladder, to serve as floats to buoy up their nets in fishing. Of the bones they make tobacco-pipes, needle-cases, and other useful things. When caught they defend themselves stoutly with the bill. Their cry is harsh and disagreeable, not unlike the braying of an ass. The breeding

Diogenes,
Diomedes.

Diomedes, breeding places of the albatross, if at all in the northern hemisphere, have not yet been pointed out; but we are certain of their multiplying in the southern, viz. Patagonia and Falkland islands: to this last place they come about the end of September or beginning of October, among other birds, in great abundance. The nests are made on the ground with earth, are round in shape, a foot in height, indented at top. The egg larger than that of a goose, four inches and a half long, white, marked with dull spots at the bigger end; and is thought to be good food, the white never growing hard with boiling. While the female is sitting, the male is constantly on the wing, and supplies her with food: during this time they are so tame as to suffer themselves to be shovelled off the nest while their eggs are taken from them; but their chief destruction arises from the hawk, which, the moment the female gets off the nest, darts thereon, and flies away with the egg. The albatross itself likewise has its enemy, being greatly persecuted while on the wing by the dark grey gull called *kua*.

This bird attacks it on all sides, but particularly endeavours to get beneath, which is only prevented by the first settling on the water; and indeed they do not frequently fly at a great distance from the surface, except obliged so to do by high winds or other causes. As soon as the young are able to remove from the nest, the penguins take possession, and hatch their young in turn. It is probable that they pass from one part of the globe to another according to the season; being now and then met with by different voyagers at various times in intermediate places. The food is supposed to be chiefly small marine animals, especially of the molluscæ or blubber class, as well as flying fish. 2. The demersa, has no quill-feathers on the wings; and the feet have four toes, connected together by a membrane. It is the black penguin of Edwards, about the size of a goose, and is found at the Cape of Good Hope. It is an excellent swimmer and diver; but hops and flutters in a strange awkward manner on the land, and, if hurried, stumbles perpetually, and frequently runs for some distance like a quadruped, making use of the wings instead of legs, till it can recover its upright posture; crying out at the same time like a goose, but in a much hoarser voice. It is said to clamber some way up the rocks in order to make the nest; in doing which, has been observed to assist with the bill. The eggs are two in number, white, as large as those of a duck, and reckoned delicious eating, at least are thought so at the Cape, where they are brought in great numbers for that purpose. At this place the birds are often seen kept tame; but in general they do not survive the confinement many months.

DIOMEDES, son of Tydeus and Deiphyle, was king of Ætolia, and one of the bravest of the Grecian chiefs in the Trojan war. He often engaged Hector and Æneas, and obtained much military glory. He went with Ulysses to steal the Palladium from the temple of Minerva in Troy; and assisted in murdering Rhesus king of Thrace, and carrying away his horses. At his return from the siege of Troy, he lost his way in the darkness of night, and landed in Attica, where his companions plundered the country and looted the Trojan Palladium. During his long absence, his wife Ægiale

forgot her marriage vows, and prostituted herself to Cometes one of her servants. This lasciviousness of the queen was attributed by some to the resentment of Venus, whom Diomedes had severely wounded in a battle before Troy. The infidelity of Ægiale was highly displeasing to Diomedes. He resolved to abandon his native country which was the seat of his disgrace; and the attempts of his wife to take away his life, according to some accounts, did not a little contribute to hasten his departure. He came to that part of Italy which has been called *Magna Græcia*, where he built a city, which he called *Agrippa*, and married the daughter of Daunus the king of the country. He died there in extreme old age; or, according to a certain tradition, he perished by the hand of his father-in-law. His death was greatly lamented by his companions, who in the excess of their grief were changed into birds resembling swans. These birds took flight into a neighbouring island in the Adriatic, and became remarkable for the tameness with which they approached the Greeks, and for the horror with which they shunned all other nations. They are called the birds of Diomedes. Altars were raised to Diomedes, as to a god, one of which Strabo mentions at Tivamus.

DION, a Syracusan, son of Hipparius, famous for his power and abilities. He was related to Dionysius, and often advised him together with the philosopher Plato, who at his request had come to reside at the tyrant's court, to lay aside the supreme power. His great popularity rendered him odious in the eyes of the tyrants, who banished him to Greece. There he collected a numerous force, and resolved to free his country from tyranny. This he easily effected on account of his uncommon popularity. He entered the port of Syracuse only in two ships; and in three days reduced under his power an empire which had already subsisted for 50 years, and which was guarded by 500 ships of war, and above 100,000 troops. The tyrant fled to Corinth, and Dion kept the power in his own hands, fearful of the aspiring ambition of some of the friends of Dionysius: but he was shamefully betrayed and murdered by one of his familiar friends called *Calliscrates*, or *Callippus*, 354 years before the Christian era.

DION CASSIUS, a native of Nicæa in Bithynia. His father's name was Apronianus. He was raised to the greatest offices of state in the Roman empire by Pertinax, and his three successors. He was naturally fond of study, and he improved himself by unremitting application. He was ten years in collecting materials for an history of Rome, which he made public in 80 books, after a laborious employment of 12 years in compiling it. This valuable history began with the arrival of Æneas in Italy, down to the reign of the emperor Alexander Severus. The 34 first books are totally lost, the 20 following, that is from the 35th to the 54th, remain entire, the six following are mutilated, and fragments is all that we possess of the last 20. In the compilation of this extensive history, Dion proposed himself Thucydides for a model, but he is not perfectly happy in his imitation. His style is pure and elegant, and his narrations are judiciously managed, and his reflections learned; but upon the whole, he is credulous,

Diomedes
||
Dion.

Dionis,
Dionæa.

credulous, and the bigoted slave of partiality, fatyr, and flattery. He inveighs against the republican principles of Brutus and Cicero, and extols the cause of Cæsar. Seneca is the object of his fatyr, and he represents him as debauched and licentious in his morals.

DIONIS (Peter), a famous surgeon, born at Paris, distinguished himself by his skill in his profession, and by his works; the principal of which are, 1. A course of operations in surgery; 2. The anatomy of man; and, 3. A treatise on the manner of assisting women in child-birth. He died in 1718.

DIONÆA MUSCIPULA, or *Venus's Fly-trap*, in botany, a newly discovered sensitive plant.

Every one skilled in natural history knows, that the mimosæ, or sensitive plants, close their leaves, and bend their joints, upon the least touch: and this has astonished us; but no end or design of nature has yet appeared to us from these surprising motions: they soon recover themselves again, and their leaves are expanded as before. But the plant we are now going to describe, shows that nature may have some view towards its nourishment, in forming the upper joint of its leaf like a machine to catch food: upon the middle of this lies the bait for the unhappy insect that becomes its prey. Many minute red glands that cover its inner surface, and which perhaps discharge some sweet liquor, tempt the poor animal to taste them; and the instant these tender parts are irritated by its feet, the two lobes rise up, grasp it fast, lock the two rows of spines together, and squeeze it to death. And further, lest the strong efforts for life, in the creature thus taken, should serve to disengage it, three small erect spines are fixed near the middle of each lobe among the glands, that effectually put an end to all its struggles. Nor do the lobes ever open again, while the dead animal continues there. But it is nevertheless certain, that the plant cannot distinguish an animal from a mineral substance; for, if we introduce a straw or a pin between the lobes, it will grasp it full as fast as if it was an insect.—The plant is one of the monogynia order, belonging to the decandria class. It grows in America, about 35 deg. N. Lat. in wet shady places, and flowers in July and August. The largest leaves are about three inches long, and an inch and half across the lobes: the glands of those exposed to the sun are of a beautiful red colour; but those in the shade are pale, and inclining to green. The roots are squamous, sending forth but few fibres, and are perennial. The leaves are numerous, inclining to bend downwards, and are placed in a circular order; they are jointed and succulent; the lower joint, which is a kind of stalk, is flat, longish, two-edged, and inclining to heart-shaped. In some varieties they are serrated on the edges near the top. The upper joint consists of two lobes; each lobe is of a semi-oval form, with their margins furnished with stiff hairs like eye-brows, which embrace or lock in each other when they close: this they do when they are inwardly irritated. The upper surfaces of these lobes are covered with small red glands; each of which appears, when highly magnified, like a compressed arbutus berry.—Among the glands, about the middle of each lobe, are three very small erect spines. When the lobes inclose any sub-

Dionæa
Dionysius.

stance, they never open again while it continues there. If it can be shewed out so as not to strain the lobes, they expand again; but if force is used to open them, so strong has nature formed the spring of their fibres, that one of the lobes will generally snap off rather than yield. The stalk is about six inches high, round, smooth, and without leaves; ending in a spike of flowers. The flowers are milk white, and stand on footstalks, at the bottom of which is a little pointed bractæa or flower-leaf. The soil in which it grows, as appears from what comes about the roots of the plants when they are brought over, is a black, light, mould, intermixed with white sand, such as is usually found in our moorish heaths. Being a swamp plant, a north-east aspect will be properest for it at first, to keep it from the direct rays of the sun; and in winter, till we are acquainted with what cold weather it can endure, it will be necessary to shelter it with a bell glass, such as is used for melons. This should be covered with straw or a mat in hard frosts. By this means several of these plants have been preserved through the winter in a very vigorous state. Its sensitive quality will be found in proportion to the heat of the weather, as well as the vigour of the plant. Our summers are not warm enough to ripen the seed; or possibly we are not yet sufficiently acquainted with the culture of it. In order to try further experiments on its sensitive powers, some of the plants might be placed in pots of light moorish earth, and placed in pans of water, in an airy stove in summer; where the heat of such a situation, being like that of its native country, will make it surprisingly active.

DIONYSIA, in Grecian antiquity, solemnities in honour of Bacchus, sometimes called by the general name of *Orgia*; and by the Romans *Bacchanalia*, and *Liberalia*. See BACCHANALIA and BACCHUS.

DIONYSIACA, in antiquity, was a designation given to plays and all manner of sports acted on the stage; because play-houses were dedicated to Dionysius, i. e. Bacchus and Venus, as being the deities of sports and pleasure.

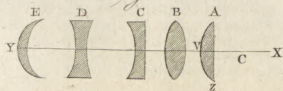
DIONYSIAN PERIOD. See CHRONOLOGY, n° 31.
DIONYSIUS I. from a private secretary became general and tyrant of Syracuse and all Sicily. He was likewise a poet; and having, by bribes, gained the tragedy-prize at Athens, he indulged himself so immoderately at table from excess of joy, that he died of the debauch, 386 B. C. but some authors relate that he was poisoned by his physicians.

DIONYSIUS II. (his son and successor) was a greater tyrant than his father: his physicians were obliged to apply to the Corinthians for succour; and Timoleon their general having conquered the tyrant, he fled to Athens, where he was obliged to keep a school for subsistence. He died 343 B. C.

DIONYSUS (Halicarnassensis), a celebrated historian, and one of the most judicious critics of antiquity, was born at Halicarnassus; and went to Rome after the battle of Actium, where he staid 22 years under the reign of Augustus. He there composed in Greek his History of the Roman Antiquities, in 20 books, of which the first 11 only are now remaining. There are also still extant several of his critical works. The best edition of the works of this author is that of



Fig. 2.



DIVISIBILITY.

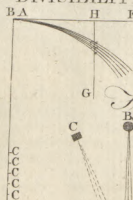


Fig. 1.

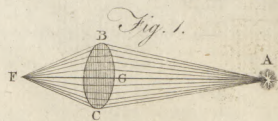


Fig. 6.

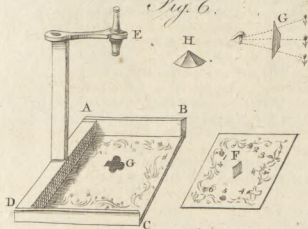


Fig. 4.

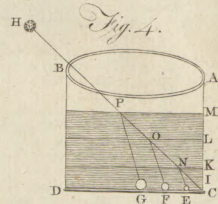


Fig. 8.

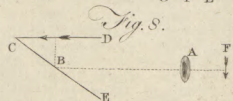


Fig. 10.

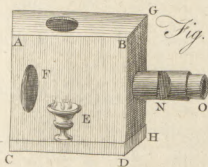


Fig. 7.

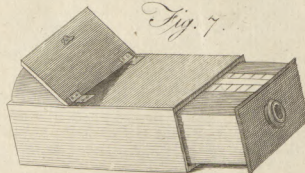


Fig. 9.

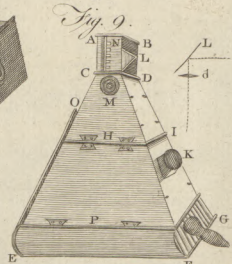


Fig. 11.

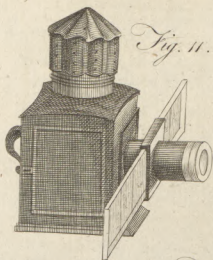


Fig. 14.



Fig. 16.

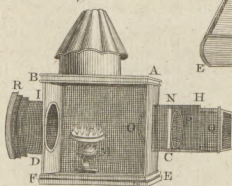


Fig. 3.

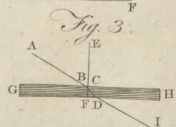


Fig. 12.

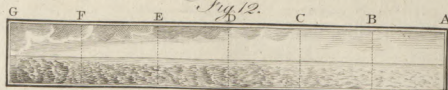
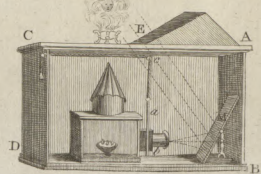


Fig. 13.



Fig. 15.



Dionysius, Oxford, in 1704, in Greek and Latin, by Dr Hudson.

DIONYSIUS, a learned geographer, to whom is attributed a *Periegesis*, or Survey of the Earth, in Greek verse. Some suppose that he lived in the time of Augustus; but Scaliger and Saumaisius place him under the reign of Severus, or Marcus Aurelius. He wrote many other works, but his *Periegesis* is the only one we have remaining; the best and most useful edition of which is that improved with notes and illustrations by Hill.

DIONYSIUS (*Areopagita*), was born at Athens, and educated there. He went afterwards to Heliopolis in Egypt; where, if we may believe some writers of his life, he saw that wonderful eclipse which happened at our Saviour's passion, and was urged by some extraordinary impulse to cry out, *Aut Deus patitur, aut cum patiente dolet*; "either God himself suffers, or condescends with him who does." At his return to Athens he was elected into the court of *Areopagus*, from whence he derived his name of *Areopagite*. About the year 50 he embraced Christianity; and, as some say, was appointed first bishop of Athens by St Paul. Of his conversion we have an account in the 17th chapter of the Acts of the Apostles.—He is supposed to have suffered martyrdom; but whether under Domitian, Trajan, or Adrian, is not certain. We have nothing remaining under his name, but what there is the greatest reason to believe spurious.

DIONYSIUS (the Lesser), a Scythian, became abbot of a monastery at Rome: he was the first who computed time from the birth of Dionysius to Christ, and fixed that great event, according to the vulgar æra. He was also a learned canon-law writer, and died about the year 540.

DIOPHANTINE PROBLEMS, in mathematics, certain questions relating to square and cube numbers,

and right-angled triangles, &c. the nature of which was determined by Diophantus, a mathematician of Alexandria, who is believed to have lived about the third century. We have his works, which were published with notes at Paris, in 1621, by Bachet de Meziriac; and another edition in 1670, with observations on every question, by M. Fermat.

In these questions it is endeavoured to find commensurable numbers to answer indeterminate problems; which bring out an infinite number of incommensurable quantities. For example, it is proposed to find a right-angled triangle, whose sides x, y, z , are expressed by commensurable numbers; it is known that $x^2 + y^2 = z^2$, z being the supposed hypotenuse. But it is possible to assume x and y so, that z will be incommensurable; for if $x = 1$, and $y = 2$, $z = \sqrt{5}$.

The art of resolving such problems consists in so managing the unknown quantity or quantities in such a manner, that the square or higher power may vanish out of the equation, and then by means of the unknown quantity in its first dimension, the equation may be resolved without having recourse to incommensurables; e. gr. let it be supposed to find x, y, z , the sides of a right-angled triangle, such as will give $x^2 + y^2 = z^2$. Suppose $z = x + u$, then $x^2 + y^2 = x^2 + 2xu + u^2$; out of which equation x^2 vanishes, and $x = \frac{y^2 - u^2}{2u}$; then assuming y and u equal to any numbers at pleasure, the

sides of the triangle will be $y, \frac{y^2 - u^2}{2u}$, and the hypotenuse $x + u = \frac{y^2 + u^2}{2u}$; if $y = 3$, and $u = 1$, then $\frac{y^2 - u^2}{2u} = 4$, and $x + u = 5$. It is evident that this problem admits of an infinite number of solutions.

For the resolution of such kind of problems, see Saunderson's Algebra, vol. ii. book 6.

D I O P T R I C S,

THAT part of OPTICS which treats of the laws of refraction, and the effects which the refraction of light has in vision. The word is originally Greek, formed of *dia per*, "through," and *optikos* I see.

As this and the other branches of OPTICS are fully treated under the collective name, we shall here, 1. Just give a summary of the general principles of the branch, in a few plain aphorisms, with some preliminary definitions; and, 2. Present our readers with a set of entertaining experiments illustrative of, or dependent upon, those principles.

D E F I N I T I O N S.

1. When a ray of light passing out of one medium into another of a different density, is turned from that straight line in which it would otherwise proceed into one of a different direction, it is said to be refracted. Thus the rays AB, AC, &c by passing out of air into the glass BGC, are turned from their natural course into that of BF, CF, &c. and are therefore said to be refracted by the lens BGC.

2. Any spherical transparent glass, that converges

or diverges the rays of light as they pass through it, is called a lens.

3. Of lenses there are five sorts: 1. A plane or single convex lens, which is plane on one side and convex on the other; as AZ, fig. 3. 2. A double convex lens, as B. 3. A plano-concave lens, that is, plane on one side and concave on the other, as C. 4. A double concave, as D. And, 5. A meniscus, which is convex on one side and concave on the other, as E.

4. The point C, round which the spherical surface of a lens, as AZ, is described, is called its centre; the line XY, drawn from that centre perpendicular to its two surfaces, is the axis; and the point V, to which the axis is drawn, is the vertex of that lens.

5. When the rays of light that pass through a single or double convex lens are brought into their smallest compass, that point is the focus of the lens.

6. In optical instruments, that lens which is next the object is called the *object-glass*; and that next the eye, the *eye-glass*.

7. The distance between the line AB and the perpendicular EF, is called the *angle of incidence*; and the distance between the line BD and the perpendicular EF, is called the *angle of refraction*.

E

APHO.

Diophan-
tine.

Fig. 2.

Fig. 3.

Plate
CLXII.
Fig. 3.

APHORISMS.

1. A ray of light passing obliquely out of one medium into another that is denser, will be refracted toward the perpendicular; as the ray AB, by passing out of air into glass, is refracted into BF, inclined to the perpendicular AF. On the contrary, a ray passing out of a denser into a rarer medium, will be refracted from the perpendicular; as the ray BC, passing out of the glass GH into air, is refracted into DI.

2. The lines of the angles of incidence and refraction, when the lines that contain them are all equal, will have a determinate proportion to each other, in the same mediums: which between air and water will be as 4 to 3; between air and glass, as 3 to 2, nearly; and in other mediums in proportion to their densities.

3. Any object viewed through a glass, whose two surfaces are parallel, will appear of its natural shape and dimensions, provided it be only of the size of the pupil of the eye, and the light proceeding from it be received directly through the glass by one eye only. In all other situations an alteration will be perceived not only in its apparent situation, but its dimensions also. This alteration will be greater in proportion to the thickness of the glass, and the obliquity of the rays; in general, it is so small as to be overlooked.

4. All the rays of light which fall upon a convex lens, whether parallel, converging, or diverging to a certain degree, will be made to meet in a focus on the other side; but if they diverge excessively, they will not do so. Thus if rays diverge from a point placed before the glass, at the focal distance from it, they will become parallel after passing through it; and if the point from which they proceed be nearer the glass than its focal distance, they will still continue to diverge, though in a less degree than before.

5. When parallel rays fall upon a concave lens, they will be made to diverge after passing through it. If they are diverging already before they fall upon the glass, they will diverge more after passing through it; or even if they are converging to a certain degree, they will diverge upon passing through a concave lens; but if the convergence is very great, they will converge after passing through the glass, though to a more distant point than that at which they would otherwise have met.

6. When an object is viewed through two convex lenses, its apparent diameter ought to be to its real one as the distance of the focus of the object-glass is to that of the eye-glass; but by reason of the aberration of the rays of light, the magnifying power will be somewhat greater or less in proportion to the diameter of the object.

By these aphorisms we are enabled to account for the various effects of dioptric machines, as refracting telescopes, microscopes, the camera obscura, &c. See OPTICS.

ENTERTAINING EXPERIMENTS.

I. Optical illusions.

Fig. 4.

On the bottom of the vessel ABCD, place three pieces of money, as a shilling, a half-crown, and

crown; the first at E, the second at F, and the last at G. Then place a person at H, where he can see no further into the vessel than I: and tell him, that by pouring water into the vessel you will make him see three different pieces of money; bidding him observe carefully whether any money goes in with the water.

Here you must observe to pour in the water very gently, or contrive to fix the pieces, that they may not move out of their places by its agitation.

When the water comes up to K, the piece at E will become visible; when it comes up to L, the pieces at E and F will appear; and when it rises to M, all the three pieces will be visible.

From what has been said of the refraction of light, the cause of this phenomenon will be evident: for while the vessel is empty, the ray HI will naturally proceed in a straight line: but in proportion as it becomes immersed in water, it will be necessarily refracted into the several directions NE, OF, PG, and consequently the several pieces must become visible.

II. Optical Augmentation.

Take a large drinking glass of a conical figure, that is small at bottom and wide at top; in which put a shilling, and fill the glass about half full with water: then place a plate on the top of it, and turn it quickly over, that the water may not get out. You will then see on the plate, a piece of the size of a half crown; and somewhat higher up, another piece of the size of a shilling.

This phenomenon arises from seeing the piece thro' the conical surface of the water at the side of the glass, and through the flat surface at the top of the water, at the same time; for the conical surface dilates the rays, and makes the piece appear larger; but by the flat surface the rays are only refracted, by which the piece is seen higher up in the glass, but still of its natural size. That this is the cause will be further evident by filling the glass with water; for as the shilling cannot be then seen from the top, the large piece only will be visible.

III. Optical Subtraction.

AGAINST the waistcoat of a room fix three small pieces of paper, as A, B, C, at the height of your eye; and placing yourself directly before them, shut your right eye and look at them with the left; when you will see only two of those papers, suppose A and B; but altering the position of your eye, you will then see the third and one of the first, suppose A; and by altering your position a second time, you will see B and C; but never all three of them together.

The cause of this phenomenon is, that one of the three pencils of rays that come from these objects, falls constantly on the optic nerve at D; whereas to produce distinct vision, it is necessary that the rays of light fall on some part of the retina E, F, G, H. We see by this experiment, one of the uses of having two eyes; for he that has one only, can never see three objects placed in this position, nor all the parts of one object of the same extent, without altering the situation of his eye.

IV. Alternate Illusion.

WITH a convex lens of about an inch focus, look
atten-

Plate
CLXIII.

Platē
CLXII.

attentively at a silver seal, on which a cipher is engraved. It will at first appear cut in, as to the naked eye; but if you continue to observe it some time, without changing your situation, it will seem to be in relief, and the lights and shades will appear the same as they did before. If you regard it with the same attention still longer, it will again appear to be engraved: and so on alternately.

If you look off the seal for a few moments, when you view it again, instead of seeing it, as at first, engraved, it will appear in relief. If, while you are turned toward the light, you suddenly incline the seal, while you continue to regard it, those parts that seemed to be engraved will immediately appear in relief: and if, when you are regarding these seeming prominent parts, you turn yourself so that the light may fall on the right hand, you will see the shadows on the same side from whence the light comes, which will appear not a little extraordinary. In like manner the shadows will appear on the left, if the light fall on that side. If, instead of a seal, you look at a piece of money, these alterations will not be visible, in whatever situation you place yourself.

It has been suspected that this illusion arises from the situation of the light: and in fact, "I have observed (says M. Guyot, from whom this article is taken), that when I have viewed it with a candle on the right, it has appeared engraved; but by changing the light to the left side, it has immediately appeared in relief." It still, however, remains to be explained, why we see it alternately hollow and prominent, without changing either the situation or the light. Perhaps it is in the light itself that we must look for the cause of this phenomenon; and this seems the more probable, as all these appearances are not discernible by all persons.

Mr William Jones of Holborn, has remarked to us, that this illusion is still more extraordinary and permanent, when you look at a cavity in a seal or other object through the three eye-glasses of a common four glass refracting telescope: all cavities viewed thro' these glasses appear constantly reliefs, in almost all situations of the light you see them with.

V. The Dioptrical Paradox.

A NEW and curious optical, or what may be called properly a *dioptrical*, deception, has been made by Mr W. Jones. Its effect is, that a print, or an ornamented drawing, with any object, such as an *ace of diamonds*, &c. in the centre F, will be seen as the *ace of clubs* when it is placed in the machine ABDC, and viewed

through a single glass only contained in the tube E. The construction of this machine is truly simple. The glass in the tube F, which brings about this surprising change, is somewhat on the principle of the common multiplying glass, as represented at G, which by the number of its inclined surfaces, and from the refractive power of the rays proceeding from the objects placed before it, shows it in a multiplied state or quantity. Its only difference is, that the sides of this glass are flat, and diverge upwards from the base to a point in the axis of the glass like a cone: the number of the sides is six; and each side, from its angular position to the eye, has the property of refracting from the border of the print F such a portion of it (designedly there placed), as will make a part in the composition of the figure to be represented: for the hexagonal and conical figure of this glass prevents any fight of the ace of diamonds in the centre being seen; consequently the ace of clubs being previously and mechanically drawn in the circle of refraction in six different parts of the border, at 1, 2, 3, 4, 5, 6, and artfully disguised in the ornamental border by blending them with it, the glass in the tube at E will change the appearance of the ace of diamonds F into the ace of clubs G. In the same manner may other prints undergo similar changes, according to the will of an ingenious draughtsman who may design them. The figure of the glass is clearly shown at H.

VI. The Camera Obscura, or Dark Chamber.

MAKE a circular hole in the shutter of a window, from whence there is a prospect of the fields, or any other object not too near; and in this hole place a convex glass, either double or single, whose focus is at the distance of five or six feet (A). Take care that no light enter the room but by this glass: at a distance from it, equal to that of its focus, place a paste-board, covered with the whitest paper; which should have a black border, to prevent any of the side rays from disturbing the picture. Let it be two feet and a half long, and 18 or 20 inches high: bend the length of it inwards, to the form of part of a circle, whose diameter is equal to double the focal distance of the glass. Then fix it on a frame of the same figure, and put it on a moveable foot, that it may be easily fixed at that exact distance from the glass where the objects paint themselves to the greatest perfection. When it is thus placed, all the objects that are in the front of the window will be painted on the paper, in an inverted position (B), with the greatest regularity and in the most natural colours.

E 2

If

(A) The distance should not be less than three feet; for if it be, the images will be too small, and there will not be sufficient room for the spectators to stand conveniently. On the other hand, the focus should never be more than 15 or 20 feet, for then the images will be obscure, and the colouring faint. The best distance is from 6 to 12 feet.

(B) This inverted position of the images may be deemed an imperfection, but it is easily remedied: for if you stand above the board on which they are received, and look down on it, they will appear in their natural position: or if you stand before it, and, placing a common mirror against your breast in an oblique direction, look down in it, you will there see the images erect, and they will receive an additional lustre from the reflection of the glass; or place two lenses, in a tube that draws out; or, lastly, if you place a large concave mirror at a proper distance before the picture, it will appear before the mirror, in the air, and in an erect position.

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If you place a moveable mirror without the window; by turning it more or less, you will have on the paper all the objects that are on each side of the window (c).

If instead of placing the mirror without the window you place it in the room, and above the hole (which must then be made near the top of the shutter), you may receive the representation on a paper placed horizontally on a table; and draw, at your leisure, all the objects that are there painted.

Nothing can be more pleasing than this experiment, especially when the objects are strongly enlightened by the sun: and not only land-prospects, but a sea-port, when the water is somewhat agitated, or at the setting of the sun, presents a very delightful appearance.

This representation affords the most perfect model for painters, as well for the tone of colours, as that degradation of shades, occasioned by the interposition of the air, which has been so justly expressed by some modern painters.

It is necessary that the paper have a circular form; for otherwise, when the centre of it was in the focus of the glass, the two sides would be beyond it, and consequently the images would be confused. If the frame were contrived of a spherical figure, and the glass were in its centre, the representation would be still more accurate. If the object without be at the distance of twice the focal length of the glass, the image in the room will be of the same magnitude with the object.

The lights, shades, and colours, in the camera obscura, appear not only just, but, by the images being reduced to a smaller compass, much stronger than in nature. Add to this, that these pictures exceed all others, by representing the motion of the several objects: thus we see the animals walk, run, or fly; the clouds float in the air; the leaves quiver; the waves roll, &c.; and all in strict conformity to the laws of nature. The best situation for a dark chamber is directly north, and the best time of the day is noon.

VII. *To show the Spots on the Sun's Disk, by its Image in the Camera Obscura.*

Put the object glass of a 10 or 12 feet telescope into the scioptropic ball, and turn it about till it be directly opposite to the sun (p). Then place the pasteboard, mentioned in the last experiment, in the focus of the lens; and you will see a clear bright image of the sun, of about an inch diameter, in which the spots on the sun's surface will be exactly described.

As this image is too bright to be seen with pleasure by the naked eye, you may view it through a lens whose focus is at six or eight inches distance; which at the same time that it prevents the light from being offen-

sive, will, by magnifying both the image and the spots, make them appear to greater advantage.

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VIII. *To magnify small Objects by means of the Sun's Rays let into a Dark Chamber.*

Let the rays of light that pass through the lens in the shutter be thrown on a large concave mirror, properly fixed in a frame. Then take a slip or thin plate of glass; and sticking any small object on it, hold it in the incident rays, at a little more than the focal distance from the mirror; and you will see, on the opposite wall, amidst the reflected rays, the image of that object, very large, and extremely clear and bright. This experiment never fails to give the spectator the highest satisfaction.

IX. *The Portable Camera Obscura.*

THE great pleasure produced by the camera obscura in the common form, has excited several to render it more universally useful by making it portable; easily fixed on any spot, and adapted to every prospect. We shall not here examine the merits of the various sorts that have been invented; but content ourselves with describing two of late improved constructions, as made and sold by the opticians of the present time, and that appear in their construction the most convenient and advantageous of any yet contrived.

The pocket or portable camera obscura, with a drawer to draw out in the front, is represented in fig. 7. Fig. 7. The images of the objects before the instrument are reflected upon a glass ground rough on its upper side, and that is placed at top of the hinder part of the box, under the moveable cover represented in the figure. The images represented thereon will afford a most beautiful and perfect piece of perspective or landscape of whatever is before the camera, and more particularly so if the sun shines upon the objects. The outlines of them may easily be traced on the glass by a black-lead pencil. There is sometimes a scale of proportions placed in the upper surface of the drawer, by which any particular building or other object may be drawn in a given proportion or magnitude, and according to the figures inserted on the scale, which are adapted to the focus or foci of the lenses made use of in the camera. The glasses that are made use of in this camera are only three, and are represented in fig. 8. The convex glass A is placed in the front of the drawer of the camera, and is of a focus agreeable to the length of the box. The mirror CE reclines in the box in an angle of 45 degrees from a perpendicular situation. The rays flowing from the object F through the convex glass A to the plane mirror CE, will be reflected from it, and meet in points on the glass placed horizontally

(c) There is another method of making the dark chamber; which is by a scioptropic ball, that is, a ball of wood, through which a hole is made, in which hole a lens is fixed: this ball is placed in a wooden frame, in which it turns freely round. The frame is fixed to the hole in the shutter; and the ball, by turning about, answers, in great part, the use of the mirror on the outside of the window. If the hole in the window be no bigger than a pea, the objects will be represented without any lens, though by no means so distinctly, or with such vivid colours.

(d) When the sun is directly opposite to the hole, the lens will itself be sufficient: or by means of the mirror on the outside of the window, as in Experiment VI. the lens will answer the purpose at any time.

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zontally in the direction CD, and will form thereon the aforementioned images. If on this glass an oiled paper or any other transparent substance be placed, the images will be clearly represented, and sufficiently so to delineate them by a black-lead pencil or crayon. Instead of the glass CD, or sometimes underneath it, is often placed a double convex lens of a focus somewhat shorter than the length of the box: this alteration considerably brightens the appearance of the images, and renders them as vivid as the objects themselves, though not quite so accurate in their contours or outlines as by the preceding method.

Another kind of portable camera obscura is, where the images are formed upon white paper, and the several parts of the camera fold up out of a box shaped like a book or chest. This way of the images being formed on paper is a much preferable one to the preceding method, and admits of their being traced on the paper with the utmost readiness. This instrument, as open out of its case and ready for use, is represented in fig. 9. The front and sides fold up to the height of about two feet from the case EFG, by means of hinges placed at P, H, &c. The head ABCD, about five inches square and high, containing the mirror L and the convex lens beneath it, fits on at CD, and the inner square tube of it is moved up and down by rack-work and a pinion NM. This motion serves to adjust the convex lens *d* to its proper focal distance from the white paper placed within side at the bottom of the box EFG, so that the images may be formed with the greatest possible distinctness. In tracing these images the face is applied close to the hole in the front at K, and the hand in the sleeve in the front at the bottom of FG. When the sides and front are unhooked and folded down, they all lie close in the box EFG, and the lid O folds down as a top on them close, and the box remains then the size of a common folio book, and is covered with calf leather and lettered on the back in perfect imitation of one.

By the diagonal position of a plane mirror the curious opera-glass is constructed, by which any person may be viewed in a theatre or public company, and yet know nothing of it. It consists only in placing a concave glass near the plane mirror, in the end of a short round tube, and a convex glass in a hole in the side of the tube. Then holding the end of the tube with the glass to the eye, all objects next to the hole in the side will be reflected so as to appear in a direct line forward, or in a position at right angles to the person's situation who is looked at. Plane glasses instead of a concave and convex may be used; but in this case there will be no magnitude of the object, but it will appear brighter. It is called by opticians the *diagonal opera-glass*.

X. The Magic Lantern.

THIS very remarkable machine, which is now known over all the world, caused great astonishment at its origin. It is still beheld with pleasing admiration; and the spectator very frequently contents himself with wondering at its effects, without endeavouring to investigate their cause. The invention of this ingenious illusion is attributed to the celebrated P. Kercher, who has published on various sciences, works equally learned, curious, and entertaining. Its design is to repre-

sent at large, on a cloth or board, placed in the dark, the images of small objects, painted with transparent colours on plates of glass.

The construction is as follows. Let ABCD be the side of a tin box, eight inches high, eight inches long, and ten broad (or any other similar dimensions), the top of which must have a funnel, with a cover, as represented in fig. 11; which at the same time it gives a passage to the smoke, prevents the light from coming out of the box. In the middle of the bottom of the box must be placed a low tin lamp E, which is to be moveable. It should have three or four lights, that must be at the height of the centre of the glasses in the tubes N and O. In the largest of these tubes must be placed a glass semicircular lens N, about four inches diameter; and in the smaller one a double convex lens O, about 2½ inches diameter, and six inches focus, the length of the tubes holding them about 4½ inches each: the inner tube containing the small lens O must be a sliding one, in order to adjust it at a proper distance from the painted sliders, so that the objects thereon may be distinctly represented on the cloth or white wall. A slit or opening between the glass N and the front side BGDH of the box must be made large enough to admit the sliders to be passed through, (as in fig. 11.) The clearness of the light, and the objects upon the cloth, will depend much upon the light of the lamp: it will therefore be proved best, to place, instead of the common lamp E, a kind of the new or Argant's Patent Lamp, which will be found considerably to improve the effect of the lantern by its superior strength of light.

From the construction of this lantern it is evident, that when the glass sliders, with the painted figures, are placed in the groove or slit in the lantern for that purpose, and the room darkened, a quantity of light from the lamp at E will be collected by the lens N, and refracted upon the cloth placed opposite; and that by moving the sliding tube containing the small lens O gradually in or out as occasion may require, this lens will form images of the figures on the sliders in their distinct colours and proportions, with the appearance of life itself, and of any size from six inches to 7 feet, according to the distance of the lantern from the cloth. The lantern, with one of the sliders ready for use, is clearly represented in fig. 11. By the aid of the new patent lamp aforementioned, considerable useful improvements are made to this lantern. Mr Jones optician of Holborn has contrived an apparatus to be applied to it, that converts it into a microscope by night; and it shows all the variety of transparent and many of the opaque objects magnified upon a cloth or screen opposite, similar to the figures above mentioned, but not in so large a degree; about one or two feet diameter is the utmost that can at present be obtained.

Method of Painting the Glasses for the Lantern. Draw on a paper the subject you desire to paint, and fix it at each end to the glass. Provide a varnish with which you have mixed some black paint; and with a fine pencil draw on the other side of the glass, with very light touches, the design drawn on the paper. If you are desirous of making the painting as perfect as possible, you should draw some of the outlines in their proper

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Fig. 9.

proper colours, provided they are the strongest tints of these colours that are used. When the outlines are dry, you colour the figures with their proper tints or degradations. Transparent colours are most proper for this purpose, such as carmine, lake, Prussian blue, verdigris, &c. and these must be tempered with a strong white varnish, to prevent their peeling off. You are then to shade them with black mixed with the same varnish, or with bistre, as you find convenient. You may also leave strong lights in some parts, without any colours, in order to produce a more striking effect. Observe, in particular, not to use more than four or five colours, such as blue, red, green, and yellow. You should employ, however, a great variety of tints, to give your painting a more natural air; without which they will represent vulgar objects, which are by no means the more pleasing because they are gawdy.

When the lamp in this lantern is lighted, and, by drawing out the tube to a proper length, the figures painted on the glass appear bright and well defined, the spectator cannot fail of being highly entertained by the succession of natural or grotesque figures that are painted on the glasses. This piece of optics may be rendered much more amusing, and at the same time more marvellous, by preparing figures to which different natural motions may be given (ε), which every one may perform according to his own taste; either by movements in the figures themselves, or by painting the subject on two glasses, and passing them at the same time through the groove, as will be seen in the next experiment.

XI. To represent a Tempest by the Magic Lantern.

Provide two plates of glass, whose frames are so thin that they may both pass freely through the slit or groove of the common magic lanterns at the same time.

On one of these glasses you are to paint the appearance of the sea, from the slightest agitation to the most violent commotion. Representing from A to B a calm; from B to C a small agitation, with some clouds; and so on to F and G, which should exhibit a furious storm. Observe, that these representations are not to be distinct, but run into each other, that they may form a natural gradation: remember also, that great part of the effect depends on the perfection of the painting, and the picturesque appearance of the design.

On the other glass you are to paint vessels of different forms and dimensions, and in different directions, together with the appearance of clouds in the tempestuous parts.

You are then to pass the glass slowly through the groove; and when you come to that part where the storm begins, you are to move the glass gently up and down, which will give it the appearance of a sea that begins to be agitated: and so increase the motion till you come to the height of the storm. At the same time you are to introduce the other glass with the ships, and moving that in like manner, you will have a natural representation of the sea, and of ships in a calm and in a storm. As you draw the glasses slowly back,

the tempest will seem to subside, the sky grow clear, and the ships glide gently over the waves.—By means of two glasses disposed in this manner you may likewise represent a battle, or sea-fight, and numberless other subjects, that every one will contrive according to his own taste. They may also be made to represent some remarkable or judicious action between different persons, and many other amusements that a lively imagination will easily suggest.

XII. The Nebulous Magic Lantern.

The light of the magic lantern, and the colour of images, may not only be painted on a cloth, but also reflected by a cloud of smoke.

Provide a box of wood or pasteboard (fig. 14.) of about four feet high, and of seven or eight inches square at bottom, but diminishing as it ascends, so that its aperture at top is but six inches long, and half an inch wide. At the bottom of this box there must be a door that shuts quite close, by which you are to place in Fig. 14. the box a chafing-dish with hot coals, on which is to be thrown incense, whose smoke goes out in a cloud at the top of the box. It is on this cloud that you are to throw the light that comes out of the lantern, and which you bring into a smaller compass by drawing out the moveable tube. The common figures will here serve. It is remarkable in this representation, that the motion of the smoke does not at all change the figures; which appear so conspicuous, that the spectator thinks he can grasp them with his hand.

Note, In this experiment some of the rays passing through the smoke, the representation will be much less vivid than on the cloth; and if care be not taken to reduce the light to its smallest focus, it will be still more imperfect.

XIII. To produce the Appearance of a Phantom upon a Pedestal placed on the middle of a Table.

ENCLOSE a common small magic lantern in a box ABCD, that is large enough to contain also an inclined mirror M; which must be moveable, that it may reflect the cone of light thrown on it by the lantern, in such a manner that it may pass out at the aperture made in the top of the box. There should be a flap with hinges to cover the opening, that the inside of the box may not be seen when the experiment is making. This aperture should likewise be oval, and of a size adapted to the cone of light that is to pass thro' it. There must be holes made in that part of the box which is over the lantern, to let out the smoke; and over that part must be placed a chafing-dish of an oblong figure, and large enough to hold several lighted coals. This chafing-dish may be inclosed in a painted tin box of about a foot high, and with an aperture at top something like fig. 14. It should stand on four short feet, to give room for the smoke of the lamp to pass out. There must also be a glass that will ascend and descend at pleasure in a vertical groove *ab*. To this glass let there be fixed a cord, that, going over a pulley

(ε) There are in the Philosophical Essays of M. Muschenbroek, different methods of performing all these various movements, by some mechanical contrivances that are not difficult to execute.

ley c , passes out of the box at the side CD, by which the glass may be drawn up, and will descend by its own weight. On this glass may be painted a spectre, or any other more pleasing figure. Observe that the figures must be contracted in drawing, as the cloud of smoke does not cut the cone of light at right angles, and therefore the figures will appear longer than they do on the glass.

After you have lighted the lamp in the lantern, and put the mirror in a proper direction, you place the box or pedestal ABCD on a table; and putting the chafin-dish in it, throw some incense in powder on the coals. You then open a trap-door, and let down the glass slowly; and when you perceive the smoke diminish you draw up the glass, that the figure may disappear, and shut the trap-door. This appearance will occasion no small surprise, as the spectre will seem to rise gradually out of the pedestal, and on drawing up the glass will disappear in an instant. Observe, that when you exhibit this experiment, you must put out all the lights in the room; and the box should be placed on a high table, that the spectators may not perceive the aperture by which the light comes out. Tho' we have mentioned a small magic lantern, yet the whole apparatus may be so enlarged, that the phantom may appear of a formidable size.

XIV. *The Magic Theatre.*

By making some few additions to the magic lantern with the square tube, used in Experiment X. various scenes, characters, and decorations of a theatre may be represented in a lively manner. In this experiment it is quite necessary to make the lantern much larger than common, that the objects painted on the glasses, being of a larger size, may be represented with greater precision, and consequently their several characters more strongly marked.

Let there be made a wooden box ABCD, a foot and a half long, 15 inches high, and 10 wide. Let it be placed on a stand EF, that must go round it, and by which it may be fixed with two screws to a table. Place over it a tin cover, as in the common lantern. Make an opening in its two narrowest sides; in one of which place the tube H, and in the other the tube I: let each of them be six inches wide, and five inches high: in each of these tubes place another that is moveable, in order to bring the glasses, or concave mirror, that are contained in them, to a proper distance. In the middle of the bottom of this box place a tin lamp M; which must be moveable in a groove, that it may be placed at a proper distance with regard to the glasses and mirror: this lamp should have five or six lights, each of them about an inch long. At the beginning of the tube H, toward the part N, make an opening of an inch wide, which must cross it laterally: another of three quarters of an inch, that must cross it vertically, and be nearer the box than the first; and a third of half an inch, that must be before the first. The opening made laterally must have three or four grooves, the second two, and the third one: that

different subjects of figures and decorations may be passed, either sidewise, ascending or descending, so that the scenes of a theatre may be the more exactly imitated (r). Inclose these grooves between two convex rectangular glasses, of six inches long, and five inches high, and of about 20 inches focus; one of which must be placed at O, and the other toward P. Have another tube Q, of about a foot long, which must enter that marked H; and at its outward extremity place a lens of about 15 inches focus. There must also be a third tube R, four inches long, into which that marked I is to enter: to the exterior end of this adjust a concave mirror, whose focus must be at seven or eight inches from its reflecting surface.

The magic lantern being thus adjusted, nothing more is necessary than to provide glasses, painted with such subjects as you would represent, according to the grooves they are to enter. The lamp is then to be lighted; and placing a glass in one of the grooves, you draw out the moveable tubes till the object paints itself on a cloth to the most advantage: by which you determine the distance of the lantern and the size of the image. You then make a hole in the partition of that size, and fix in it a plate of clear glass, over which you paste a very thin paper, which must be varnished, that it may be as transparent as possible.

On this paper are to be exhibited the images of all those objects, that, by passing successively through the grooves, are to represent a theatric entertainment. The exhibition will be very agreeable; because the magic lantern being concealed behind the partition, the cause of the illusion cannot by any means be discovered.

In order to show more clearly in what manner a subject of this sort should be painted, and the glasses disposed, we will here make choice of the siege of Troy for a theatric subject; in which will be found all the incidents necessary to the exhibition of any other subject whatever.—In the first act, the theatre may represent, on one side, the ramparts of Troy; toward the back-part, the Grecian camp; and at a further distance, the sea, and the life of Tenedos. We will suppose the time to be that when the Greeks feigned to raise the siege; and embarked, leaving behind them the wooden horse, in which were contained the Grecian soldiers.

—On a glass, therefore, of the same width with the aperture made in the side AC of the box, you are to paint a deep blue curtain, lightly charged with ornaments, quite transparent. This glass is to be placed in the first vertical groove; so that by letting it gently down, its image may appear to rise in the same manner as the curtain of a theatre. All the glasses that are to ascend or descend must be bordered with thin pieces of wood, and so exactly fill the grooves, that they may not slide down of themselves.—You must have several glasses of a proper size to pass through the horizontal grooves, and of different lengths according to the extent of the subject. You may paint, on the first, the walls of Troy. On the second, the Grecian camp. On the third, the sea, the life of Tenedos, and a serene sky. On the fourth, the Grecian

troops:

(r) In the decorations, the clouds and the palaces of the gods should descend; caves and infernal palaces should ascend; earthly palaces, gardens, &c. enter at the sides.

troops by detached figures. On the fifth, other troops, disposed in battalions, and placed at a distance. On the sixth, divers vessels, which as the glass advances in the groove diminish in size. On the seventh, the wooden horse and Sinon. On the eighth, Trojan men and women.

These glasses being properly painted, you place in the horizontal grooves the first, second, third, and fourth. Then draw up the curtain, by letting down the glass on which it is painted, and draw away gently the fourth glass, and after that the second; then advance very gently the fifth, that represents the embarkment, and pass it quite through. Next pass, the opposite way, the sixth, which represents the Grecian fleet. The objects painted on the fourth, fifth, and sixth, quite disappearing, you are to advance the seventh, on which is painted the wooden horse; and at the same time the eighth, where the Trojans will appear to draw the horse into the city. The curtain is then to be let down, that you may withdraw the scenes of the first act, and place in the grooves those that are to compose the second.—In the second act may be represented the interior part of the city of Troy: on one side may be seen the wooden horse, and in the back part the temple of Pallas. The glasses for this act may be painted in the following manner. On the first may be palaces and houses, representing the inside of a city. On the second, the temple of Pallas in the centre, with a clear night and the moon. In the front may be seen the wooden horse, that the Trojans have placed near the temple of Pallas. On the third, a troop of Greeks, with Sinon at their head, who are going to open the gates of the city to the Grecians. On the fourth, different troops of armed Greeks; painted on a long glass, to afford variety. On the fifth, several troops of Trojans. On the sixth, various appearances of fire and smoke, so disposed, that, this glass being drawn up above the others, the objects painted on the first glass may appear in a conflagration.

Before you draw up the curtain, you should place the first and second glasses. You then pass the whole third glass slowly; a little after, the fourth, on which are painted the different bodies of armed Greeks; and at the same time, from the opposite side, the sixth glass, that represents the Trojan troops; observing to move them slowly both in advancing and retreating, to imitate a combat (c). Then draw up, by degrees, the sixth, on which are painted the fire, flame, and smoke, so that the palaces and houses painted on the first glass may appear to take fire gradually, and at last present a general conflagration. After having represented these incidents with the greatest attention, you let fall the curtain to prepare for the third act. In this may be represented the inside of Priam's palace; where is seen an altar, round which several Trojan princesses appear, who have fled thither for safety. On the first glass may be painted the palace. On the second, a view of

the back part of the palace, with the altar. On the third, Priam with several Trojan men and women. On the fourth, Pyrrhus and a troop of Greeks. On the fifth, the same actors, with the palace in flames. On the sixth, a conflagration.—The two first glasses which are to be drawn up, should be placed before you raise the curtain. Then pass the third; next advance the fourth; which being drawn up, discovers on the fifth the palace in flames; then drawing up the sixth, let down the first, that the palace may appear entirely destroyed by the conflagration.

The fourth act may represent the environs of Troy, with a distant prospect of the sea. The first and third glasses of the first act may be here used; to which may be added a third, representing Æneas bearing his father Anchises, followed by his son Iulus and some Trojans. With this glass may be represented the flight of the Trojans and the embarkment of Æneas; with another glass, on which are painted certain vessels.—To this act the following scenes may be added: The cave of Æolus; the back part of the cave; Æolus; the winds; Juno in her chariot.

The fifth act should represent the open sea, with the fleet of Æneas sailing for Italy. On the first glass must be painted the sea, as in the eleventh Experiment, or else the waves should be imitated by another glass under the first. On the second, the Trojan fleet. On the third, Neptune in his car. On the fourth, the palace of Jupiter. On the fifth, the inside of the palace; the gods assembled in council, with Venus obtaining leave of Jupiter for Æneas to land in Italy.—After having placed the first glass, that represents a calm sea, the curtain is raised, and the second scene is advanced, which contains the Trojan fleet. The first is then brought forward, to represent a violent tempest: then raising the third glass, Neptune appears, who commands the waves to be still, which is done by making the tempest subside by degrees. The fleet then advances, and passes over the whole theatre: presently after the fourth and fifth scenes descend, that represent Olympus, and finish the exhibition.

Note, We must here repeat, that if you would represent a subject of this sort to advantage, it is quite necessary that the glasses be well painted; and those that are to be in front should be in stronger and more opaque colours, that the images of those behind may not appear mixed with them, which will be the case if they are all equally transparent. The glasses should also be of different lengths; that some being placed before the others are drawn away, their extremities may not be perceived.

The larger these subjects are represented, the better effect they will have: the front of the theatre should appear to be about three feet wide; and if some parts of the figures were moveable, it would still add to the variety of the entertainment.

(c) He that moves the glasses, seeing the effect they produce, is the better able to render the representation as natural as possible.

Dioscorea
||
Diosma

DIOSCOREA, in botany: A genus of the hexandria order, belonging to the diœcia class of plants; and in the natural method ranking under the 11th order, *Sarmenlaceæ*. The male calyx is fœspartite; there is no corolla: The female calyx is fœspartite; no corolla; three styles; the capsule trilocular and compressed; and there are two membranaceous seeds. There are eight species, of which the only remarkable one is the bulbifera, or yam. This hath triangular winged stalks, which trail upon the ground, and extend a great way: these frequently put out roots from their joints as they lie upon the ground, by which the plants are multiplied. The roots are eaten by the inhabitants of both the Indies; and are particularly serviceable in the West India islands, where they make the greatest part of the negroes food. The plant is supposed to have been brought from the East to the West Indies; for it has never been observed to grow wild in any part of America; but in the island of Ceylon, and on the coast of Malabar, it grows in the woods, and there are in those places a great variety of sorts. It is propagated by cutting the root in pieces, observing to preserve an eye in each, as is practised in planting potatoes. One plant will produce three or four large roots. The skin of these roots is pretty thick, rough, unequal, covered with many stringy fibres or filaments, and of a violet colour approaching to black. The inside is white, and of the consistence of red beet. It resembles the potato in its mealiness, but is of a closer texture. When raw, the yams are viscous and clammy: when roasted or boiled, they afford very nourishing food; and are often preferred to bread by the inhabitants of the West Indies, on account of their lightness and facility of digestion. When first dug out of the ground, the roots are placed in the sun to dry: after which, they are either put into sand, dry garrets, or casks; where, if kept from moisture, they may be preserved whole years, without being spoiled or diminished in their goodness. The root commonly weighs two or three pounds; though some yams have been found upwards of 20 pounds weight.

DIOSCORIDES, a physician of Cilicia, who lived, as some suppose, in the age of Nero. He was originally a soldier; but afterwards he applied himself to study, and wrote a book upon medicinal herbs.

DIOSCURIA (*Dioscuria*, from *Διός* Jupiter, and *νοῦς* infants), in antiquity, a festival in honour of the *Dioscuri*, or Castor and Pollux, who were reputed to be the sons of Jupiter. It was observed by the Cyrenæans, but more especially by the Spartans, whose country was honoured by the birth of these heroes. The solemnity was full of mirth, being a time wherein they shared plentifully of the gifts of Bacchus, and diverted themselves with sports, of which wrestling matches always made a part.

DIOSMA, AFRICAN SPIRÆA: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is pentapetalous, the nectarium crown-shaped above the germin; there are five capsules coalesced; the seeds hooded. There are nine species; of which the most remarkable are the hirsuta, with narrow hairy leaves; and the oppositifolia, with leaves placed in the form of a cross. The first is a very handsome shrub, growing to the

height of five or six feet: the stalks are of a fine coral colour: the leaves come out alternately on every side of the branches, and are narrow-pointed and hairy: the flowers are produced in small clusters at the end of the shoots, and are of a white colour. They are succeeded by starchy seed-vessels having five corners; in each of which corners is a cell, containing one smooth, shining, oblong, black seed: these seed-vessels abound with a resin which emits a grateful scent, as doth also the whole plant.—The second species rises to the height of three or four feet: the branches are slender, and produced from the stem very irregularly; the leaves are placed cross-ways; the flowers are produced at the ends of the branches, between the leaves: the plants continue a long time in flower, and make a fine appearance when they are intermixed with other exotics in the open air. Both species are propagated by cuttings; which may be planted during any of the summer-months in pots, and plunged into a moderate hot-bed, where they should be shaded from the sun, and frequently watered. In about two months they will have taken root; when each should be transplanted into a small pot where they are to remain; but during winter, like most other exotic plants, they must be preserved in a green-house.

DIOSPOLIS (anc. geog.), a city of the Delta, or Lower Egypt; to the south of the Busrifric branch, before it divides into two.—Another of Bithynia, in the territory of Heraclea.—A third, called *Magna*, denoting Thebes of the Higher Egypt.—A fourth, *Diospolis Parva*, the metropolis of the Nomos Diospolites of the Higher Egypt.—A fifth, *Diospolis* of Samaria, the same with Lydda.—A sixth *Diospolis*; the ancient name of Laodicea of Phrygia on the Lycus.

DIOSPOLITES nomos (Ptolemy), a division of Thebais or the Higher Egypt, to distinguish it from another of the Lower Egypt or the Delta; to the south of the Nomos Thinites, on the west side of the Nile.

DIOSPYROS, the INDIAN DATE-PLUM: A genus of the diœcia order, belonging to the polygamia class of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is hermaphrodite and quadrifid; the corolla ureolated and quadrifid; there are eight stamina; the style quadrifid; the berry octospermous: the male calyx, corolla, and stamina, as in the former. There are two species. 1. The lotus, which is supposed to be a native of Africa, from whence it was transplanted into several parts of Italy, and also into the south of France. The fruit of this tree is supposed to be the lotus with which Ulysses and his companions were enchanted, and which made those who eat of it forget their country and relations: (See also RHAMNUS.) In the warm parts of Europe this tree grows to the height of 30 feet. In the botanic garden at Padua, there is one very old tree which has been described by some of the former botanists under the title of *guaiacum patavinum*. This tree produces plenty of fruit every year; from the seeds of which many plants have been raised. 2. The Virginiana, pinshamin, persimon, or pitchumon plum, is a native of America, but particularly of Virginia and Carolina. The seeds of this sort have been frequently imported into Britain, and the trees are common in many nurseries about London. It rises to the height of 12 or 14 feet; but generally divides into many irregular

Diospolis
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Diospyros

Diphthong
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Diplom-
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trunks near the ground, so that it is very rare to see a handsome tree of this sort. Though plenty of fruit is produced on these trees, it never comes to perfection in this country. In America the inhabitants preserve the fruit till it is rotten, as is practised with medlars in England; when they are esteemed very pleasant. Both species are propagated by seeds: and the plants require to be treated tenderly while young; but when they are grown up, they resist the greatest cold of this country.

DIPHTHONG, in grammar, a double vowel, or the mixture of two vowels pronounced together, so as to make one syllable.

The Latins pronounced the two vowels in their diphthongs *ae* or *æ*, *oe* or *œ*, much as we do; only that the *oe* was heard much weaker than the other, tho' the division was made with all the delicacy imaginable. Diphthongs, with regard to the eyes, are distinguished from those with regard to the ears: In the former, either the particular sound of each vowel is heard in the pronunciation; or the sound of one of them is drowned; or, lastly, a new sound, different from either, results from both: the first of these only are real diphthongs, as being such both to the eye and ear. Diphthongs with regard to the ear are either formed of two vowels meeting in the same syllable, or whose sounds are severally heard; or of three vowels in the same syllable, which only afford two sounds in the pronunciation.

English diphthongs, with regard to the eye and ear, are *ai*, *au*, *ea*, *ee*, *ei*, *eo*, *ou*. Improper English diphthongs, with regard to the eye only, are *au*, *ea*, *eo*, *eu*, *ie*, *ei*, *oa*, *oe*, *ue*, *ui*.

DIPLOE, in anatomy, the soft medullium, or medullary substance, which lies between the two laminae of the bones of the cranium. See ANATOMY, n° 11.

DIPLOMA. See DIPLOMATICS.

In a peculiar sense, it is used for an instrument or licence given by colleges, societies, &c. to a clergyman to exercise the ministerial function, or to a physician to practise the profession, &c. after passing examination, or admitting him to a degree.

DIPLOMATICS, the science of diplomas, or of ancient literary monuments, public documents, &c. It does not however, nor can it, absolutely extend its researches to antiquity; but is chiefly confined to the middle age, and the first centuries of modern times. For though the ancients were accustomed to reduce their contracts and treaties into writing; yet they graved them on tables, or covered them over with wax, or brass, copper, stone, or wood, &c. And all that in the first ages were not traced on brass or marble, has perished by the length of time, and the number of destructive events.

1. The word *diploma* signifies, properly, a letter or epistle, that is folded in the middle, and that is not open. But, in more modern times, the title has been given to all ancient epistles, letters, literary monuments, and public documents, and to all those pieces of writing which the ancients called *Syngrapha*, *Chirographa*, *Codicilli*, &c. In the middle age, and in the diplomas themselves, these writings are called *Litteræ*, *Præcepta*, *Placita*, *Charta indicule*, *Sagilla*, and *Bulle*; as also *Pancharte*, *Pantocharte*, *Trasoria*, *Descriptio*nes,

&c. The originals of these pieces are named *Exemplaria*, or *Autographa*, *Chartæ authentica*, *Originalia*, &c. and the copies, *Apographa*, *Copie*, *Particule*, and so forth. The collections that have been made of them, are called *Chartaria* and *Chartulæ*. The place where these papers and documents were kept, the ancients named *Scrinia*, *Tabularium*, or *Ænarium*, words that were derived from the tables of brass, and, according to the Greek idiom, *Archæum* or *Archivum*.

2. In order to understand the nature of these ancient papers, diplomas, and manuscripts, and to distinguish the authentic from the counterfeit, it is necessary to know that the paper of the ancients came from Egypt, and was formed of thin leaves or membranes, taken from the branches of a tree named *Papyrus*, or *Bibulum Ægyptiacum*, and which were passed one over the other with the slime of the Nile, and were pressed and polished with a pumice-stone. This paper was very scarce; and it was of various qualities, forms, and prices, which they distinguished by the names of *charta hieratica*, *luria*, *augusta*, *amphibæatica*, *isaiica*, *tamirica*, *emporetica*, &c. They cut this paper into square leaves, which they passed one to the other, in order to make rolls of them: from whence an entire book was called *volumen*, from *voloendo*; and the leaves of which it consisted, *pagina*. Sometimes, also, they passed the leaves all together by one of their extremities, as is now practised in binding; by this method they formed the back of a book, and these the learned call *codices*. They rolled the volume round a stick, which they named *umbilicus*; and the two ends that came out beyond the paper, *cornua*. The title, wrote on parchment, in purple characters, was joined to the last sheet, and served it as a cover. They made use of all sorts of strings or ribbands, and even sometimes of locks, to close the book; and sometimes also it was put into a case. But there is not now to be found, in any library or cabinet whatever, any one of these volumes. We have been assured, however, by a traveller, that he had seen several of them in the ruins of Herculaneum; but so damaged, the paper so stiff and brittle, by the length of time, that it was impossible to unroll them, and consequently to make any use of them; for on the first touch they fell into shatters.

3. We are ignorant of the precise time when our modern paper was invented: and when they began to make use of pens in writing, instead of the stalks of reeds. The ink that the ancients used, was not made of vitriol and galls, like the modern, but of foot. Sometimes also they wrote with red ink made of vermilion; or in letters of gold, on purple or violet parchment. It is not difficult for those who apply themselves to this study, to distinguish the parchment of the ancients from that of the moderns, as well as their ink and various exterior characters: but that which best distinguishes the original from the counterfeit is, the writing or character itself; which is so distinctly different from one century to another, that we may tell with certainty, within about 40 or 50 years, when any diploma was written. There are two works which furnish the clearest lights on this matter, and which may serve as sure guides in the judgments we may have occasion to make on what are called *ancient diplomatæ*. The one is the celebrated treatise on the Diplomatic, by F. Mabillon; and the other, the first volume of the *Chronicon*

Bisfield's
Elements.

Diploma nicon Gotvicense. We there find specimens of all the characters, the flourishes, and different methods of writing, of every age. For these matters, therefore, we must refer our readers to those authors; and shall here only add, that,

4. All the diplomas are wrote in Latin, and consequently the letters and characters have a resemblance to each other: but there are certain strokes of the pen which distinguish not only the ages, but also the different nations; as the writings of the Lombards, French, Saxon, &c. The letters in the diplomas are also usually longer, and not so strong as those of manuscripts. There has been also introduced a kind of court-hand, of a very disproportionate length, and the letters of which are called *Exiles litteræ, crispæ, ac protrahiores*. The first line of the diploma, the signature of the sovereign, that of the chancellor, notary, &c. are usually wrote in this character.

5. The signature of a diploma consists either of the sign of the cross, or of a monogram or cipher, composed of the letters of the names of those who subscribed it. The initial letters of the name, and sometimes also the titles, were placed about this cross. By degrees the custom changed, and they invented other marks; as, for example, the sign of Charlemagne was thus:



They sometimes added also the dates and epoch of the signature, the feasts of the church, the days of the calendar, and other like matters. The successive corruption of the Latin language, the style and orthography of each age, as well as their different titles and forms; the abbreviations, accentuation, and punctuation, and the various methods of writing the diphthongs; all these matters united, form so many characters and marks by which the authenticity of a diploma is to be known.

6. The seal annexed to a diploma was anciently of white wax, and artfully imprinted on the parchment itself. It was afterward pendent from the paper, and inclosed in a box or case, which they called *bulia*. There are some also that are stamped on metal, and even on pure gold. When a diploma bears all the characters that are requisite to the time and place where it is supposed to be written, its authenticity is not to be doubted: but, at the same time, we cannot examine them too scrupulously, seeing that the monks and priests of former ages have been very adroit in making of counterfeits; and the more, as they enjoyed the confidence of princes and statesmen, and were even sometimes in possession of their rings or seals.

7. With regard to manuscripts that were wrote before the invention of printing, it is necessary (1.), to know their nature, their essential qualities, and matter; (2.) to be able to read them freely, and without error; (3.) to judge of their antiquity by those characters which we have just mentioned with regard to the diplomas; and, (4.) to render them of use in the sciences. As there are scarce any of the ancient codes now remaining (see par. 2.), wrote on the Egyptian paper, or on wood, ivory, &c. we have only to consider those that are written on parchment or vellum (*membræneas*),

and such as are wrote on our paper (*chartaceas*). The former of these are in most esteem. With regard to the character, these codes are written either in square and capital letters, or in half square, or round and small letters. Those of the first kind are the most ancient. There are no intervals between the words, no letters different from the others at the beginning of any word, no points, nor any other distinction. The codes which are wrote in letters that are half square, resemble those we have in Gothic characters, as well for the age as the form of the letters. Such as are wrote in round letters are not so ancient as the former, and do not go higher than the ninth or tenth century. These have spaces between the words, and some punctuation. They are likewise not so well wrote as the preceding, and are frequently disfigured with comments. The codes are divided, according to the country, into Lombard, Italian, Gaulic, Franco-Gaulic, Saxon, Anglo-Saxon, &c.

8. In the ancient Greek books, they frequently terminated the periods of a discourse, instead of all other division, by lines; and these divisions were called, in Latin, *versus*, from *vertendo*: for which reason these lines are still more properly named *versus* than *lineæ*. At the end of a work, they put down the number of verses of which it consisted, that the copies might be more easily collated: and it is in this sense we are to understand Trebonius, when he says, that the pandects contain 150,000 *pene versusum*. These codes were likewise *vel probe vel deterioris notæ*, more or less perfect, not only with regard to the calligraphy or beauty of the character, but to the correction of the text also.

9. It is likewise necessary to observe, in ancient codes, the abbreviations, as they have been used in different centuries. Thus, for example, A. C. D. signifies, Aulus Caius Decimus; Ap. Cn. Appius Cneius; Aug. Imp. Augustus Imperator. The characters that are called *notæ*, are such as are not to be found in the alphabet; but which, notwithstanding, signify certain words. All these matters are explained in a copious manner by Vossius, and in the Chronicon Gotvicense. Lastly, the learned divide all the ancient codes into *codices minus raros, rariores, editos, & anecdotos*. The critical art is here indispensably necessary: its researches, moreover, have no bounds; and the more, as the use of it augments every day, by the discoveries that are made in languages, and by the increase of erudition.

DIPONDIIUS, in the scripture-language, is used by St Luke to signify a certain coin which was of very little value. Our translation of the passage is, *Are not two sparrows sold for two farthings?* In St Matthew, who relates the same thing, we read *Are not two sparrows sold for a farthing?* The Greek reads *assaron* instead of *as*. Now *assaron*, as some say, was worth half an *as*, that is to say, four French deniers and $\frac{1}{2}$ th; and, according to others, two deniers and $\frac{1}{2}$ th. *Dipondius* seems rather to signify half an *as*. Calmet, Dict. Bibl. Luke xii. 6. Matt. x. 29.

Dr Arbuthnot differs in opinion from the author last quoted. He says, that this coin was at first *libra*, or of a pound weight; and even when diminished, it retained the name of *libella*. So that *dipondius* denotes two *alies*.

DIPPING, among miners, signifies the interrup-

Dipping-
Needle.

tion or breaking off the veins of ore; an accident that gives them a great deal of trouble before they can discover the ore again. A great deal of the skill of the miners consists in the understanding this dipping of the veins, and knowing how to manage in it. In Cornwall they have this general rule to guide them in this respect: most of their tin-loads, which run from east to west, constantly dip towards the north. Sometimes they underlie; that is, they slope down towards the north three feet in height perpendicular. This must carefully be observed by the miners, that they may exactly know where to make their air-shafts when occasion requires; yet, in the higher mountains of Dartmoor, there are some considerable loads, which run north and south; these always underlie toward the east. Four or five loads may run nearly parallel to each other in the same hill; and yet, which is rare, they may meet all together in one hatch, as it were a knot, which well tells the place, and so separate again, and keep their former distances.

Dipping-Needle, an instrument used for observing the quantity of inclination towards the earth, assumed by any needle or other body after it has acquired the magnetic virtue. This was first observed by one Robert Norman, an Englishman, and maker of compasses for mariners, in the end of the 16th century; who finding that he was always obliged to counterbalance that end which turns to the north by a bit of wax or such other substance, though the balance had been ever so exact before, published an account of his discovery as a matter of importance. The subject was instantly attended to; and instruments were not only contrived for ascertaining the quantity of the dip, but various speculations formed concerning the cause of such a surprising phenomenon.

The general phenomena of the dipping-needle are: That about the equatorial parts of the earth it remains in an horizontal position, but depresses one end as we recede from thence; the north end if we go towards the north, and the south end if we proceed towards the south pole. The farther north or south that we go, the inclination becomes the greater; but there is no place of the globe hitherto discovered where it points directly downwards, though it is supposed that it would do so in some part very near the pole. Its inclination is likewise found to vary very considerably at different times in different places of the earth, and by some changes of situation in such a manner as must appear at first sight very unaccountable. Of all those who have attempted the investigation of this obscure subject, none have been more successful than M. Cavallo, who in his Treatise on Magnetism has given particular attention to all the phenomena, and accounted for them upon plain and rational principles, in the following manner.

The dip of the magnetic needle in general may be understood from the following easy experiment: Lay an oblong magnet horizontally upon a table, and over it suspend another smaller magnet (a few inches to which the magnetic virtue has been communicated will answer the purpose), in such a manner as to remain in an horizontal position when not disturbed by another magnet. Now, if this last small magnet or sewing needle, suspended by the middle, be brought

just over the middle of the large one, it will turn itself in such a manner that the south pole of the small magnet will point towards the north pole of the large one; and if at an equal distance from both, will remain in an horizontal position. But if we move it nearer to one of the poles than the other, it will readily be understood that the corresponding end of the needle will be attracted by the pole to which it approaches, and of consequence inclined downwards; the contrary end being proportionably elevated. It is likewise evident, that this inclination will be greater or less according to the distance at which the small magnet is placed from the pole of the large one; the attraction of the nearest pole having always the greatest effect upon it. And it is equally plain, that when brought directly over one of the poles of the large magnet, it will turn its own contrary one directly towards it, and thus lie exactly in the axis of the large one.

The application of this experiment to the phenomena of the dipping-needle is obvious, as nothing more is requisite for solving the whole mystery than to suppose the earth itself to be the large magnet, and the magnetic needle or any other magnetic body the small magnet in the experiment: for admitting that the north pole of the earth possesses a south magnetism, and that the opposite pole is possessed of a north magnetical polarity; it appears, and the theory is confirmed by experiment, that when a magnet is suspended properly in the equatorial parts of the world, it must remain in an horizontal position; but when removed nearer to one of the poles, it must incline one of its extremities, viz. that which is possessed of the contrary magnetic polarity; and that this inclination must increase in proportion as the magnet or magnetic-needle recedes from the equator of the earth; and, lastly, when brought exactly upon either of the poles of the earth, it must stand perpendicular to the ground, or in the same direction with the axis of the earth.

The only difficulty in this explanation arises from the attributing a south magnetism to the north pole of the earth: but by this our author means only that its magnetism is contrary to that end of the magnetic needle which turns towards it; and in the same manner it must be understood, that the south pole of the earth has a north magnetic polarity.

If the extremities of the axis of the earth, or the poles about which it performs its diurnal revolution, coincided with its magnetic poles, or even if the magnetic poles were always at a certain distance from them, the inclination of the needle would be always the same at equal distances from the equator, and might be very useful for determining the latitudes. But it would seem, that these poles are perpetually shifting their place, since both the inclination and horizontal direction of the needle are continually varying even in the same place; so that its quantity of inclination cannot be exactly calculated. Two general remarks may be made upon this subject. 1. That the inclination of the needle does not alter regularly in going from north to south, or from south to north, in any meridian. 2. That its alteration in the same place, and at different times, is but small. Thus, in London, about the year 1576, the dip was $71^{\circ} 50'$ below the horizon, and in 1775 it stood at $72^{\circ} 3'$; the alteration in near 200

Dipping-
Needle.

Dipping-
Needle,
Dipfacus.

years scarce amounting to three quarters of a degree, which may be attributed to the errors of the instruments; as these were at first exceedingly erroneous, and even yet are far from being arrived at perfection.

The general method of constructing dipping-needles is, to pass an axis quite through the needle itself, and to let the extremities of the axis rest upon two supports, like the beam of a pair of scales, that the needle may move vertically round; and hence, when placed in the magnetic meridian, it will naturally assume that position which is called the *magnetic line*, viz. the two ends nearly north and south, and one of them inclined considerably to the horizon. The degrees of this inclination are shown upon a graduated circle; and when the instrument is made use of at land it has a stand, but at sea a ring is necessary to suspend it. When furnished with a stand, it has also a spirit-level; and the stand has three screws, by which the whole is adjusted in such a manner as to let the centre of motion in the needle, and the mark of 90° on the lower part of the divided circle, be exactly in the same line perpendicular to the horizon.

The greatest imperfections attending this instrument are the balancing of the needle itself, and the difficulty of knowing whether, after being made magnetic, it be properly balanced or not. The inaccuracy here indeed can be but very small, as arising only from dust or moisture. The method recommended by Mr Cavallo to obviate these inconveniences, is first to observe the dip of the needle; then to reverse its magnetism by the application of magnets, so that the end of it which before was elevated above the horizon may now be below it; and, lastly, to observe its dip again; for a mean of the two observations will be pretty near the truth, though the needle may not be perfectly balanced. See *MAGNETISM*, and *MAGNETICAL Needle*.

DIPSACUS, TEAZEL, in botany: A genus of the monogynia order, belonging to the tetrandia class of plants; and in the natural method ranking under the 48th order, *Aggregate*. The common calyx is polyphyllous, proper above; the receptacle paleaceous. There are four species; the most remarkable of which is the *carduus fullonum*, which grows wild in many parts of England. It is of singular use in raising the knap upon woollen cloth. For this purpose, the heads are fixed round the circumference of a large broad wheel, which is made to turn round, and the cloth is held against them. In the west of England, great quantities of the plant are cultivated for the use just now mentioned. It is propagated by sowing the seeds in March, upon a soil that is well prepared. About one peck of seed is sufficient for an acre, as the plants must have room to grow; otherwise the heads will not be large enough, nor in great quantity. When the plants come up, they must be hoed in the same manner as is practised for turnips, cutting down all the weeds, and thinning the plants to about eight inches distance; and as the plants advance, and the weeds begin to grow again, they must be hoed a second time, cutting out the plants to a wider distance, so that they may finally stand a foot distant from each other. The second year they will shoot up heads, which may be cut about the beginning of August. They are then to be tied up in bunches, and left in the sun if the weather is fair; or if not, in rooms to dry them. The common produce

is about 160 bundles or staves upon an acre, which are sold for one shilling each.

The leaves of the common wild teazel, dried, and given in powder or infusion, are a very powerful remedy against flatulencies and crudities in the stomach. There is also another, though somewhat whimsical, use for which this plant is famous among the country people in England. If the heads are opened longitudinally, about September or October, there is generally found a small worm in them: one of these only is found in each head, whence naturalists have named it the *vermis solitarius dipfici*. They collect three, five, or seven of these, always observing to make it an odd number; and, sealing them up in a quill, give them to be worn as an amulet against the ague. This superstitious remedy is in much higher repute than the bark, in many parts of England.

DIPSAS, a sort of serpent, the bite of which produces such a thirst as proves mortal; whence its name *dipfus*, which signifies thirsty. In Latin it is called *fiula*, "a pail." Moses speaks of it in Deut. viii. 15.

DIPTERA (from *dis*, and *τερον*, wing), in zoology, an order of insects, which have only two wings, and under each wing a style or oblong body, terminated by a protuberance or head, and called a *balancer*.

DIPTOTES, in grammar, are such nouns as have only two cases, as *suppetias*, *suppetias*, &c.

DIPTYCHIA, in antiquity, a public register, wherein were written the names of the consuls, and other magistrates, among the heathens; and of bishops, and defunct as well as surviving brethren, among the Christians.

The word is formed from the Greek *διπτυχον*, or *διπτυχα*, and that from *διπτος*, a masculine noun derived from *πτισσω* I fold, or plait. From its future *πτύξω* is formed *πτύξ* a fold or plait, to which adding *dis* twice, we have *διπτύξ*, in the genitive *διπτύχου*, whence the nominative neuter *διπτύχον*, q. d. a book folded in two leaves; though there were some in three, and others in four or five leaves. An ingenious author imagines this name to have been first given them to distinguish them from the books that were rolled, called *volumina*.

It is certain there were profane diptycha in the Greek empire, as well as sacred ones in the Greek church. The former were the matricula, or register, wherein the names of the magistrates were entered; in which sense diptycha is a term in the Greek chancery.

Sacred DIPTYCHA. The word is plural; diptycha being a double catalogue, in one whereof were written the names of the living, and in the other those of the dead, which were to be rehearsed during the office. We meet with something not unlike the sacred diptychs of the Greeks, in the canon of the mass according to the Latin usage; where the people are enjoined to pray once for the living, and once for the dead; several saints are invoked in different times, &c. In these diptycha were entered the names of bishops, who had governed their flocks aright; and these were never expunged out of the same, unless they were convicted of heresy, or some other gross crime. In the diptycha were likewise entered the names of such as had done any signal service to the church, whether they were

Dipfas
||
Diptycha.

living

Dirca
Distributors.

living or dead, and mention was made of them in the celebration of the liturgy.

Casaubon, in his observations on Athenæus, lib. vi. cap. 14. supposes the Christians to have borrowed the custom of writing names in a book, and rehearsing them at mass, from the heathens, who entered the names of persons they would do any signal honour to, in the verses of the Salli; as was done to Germanicus and Verus, sons of the emperor Marcus Aurelius, and long time before, during the age of the republic, to Manurcus Veturius, and Lucia Volumnia, as we are told by Tacitus, lib. ii. Spartian, Ovid, Festus, Plutarch, &c. But Fa. Rosweyde does not approve this notion of Casaubon. The pretended St Dionysius, a very ancient author, for the contrary, and asserts the first establishment of this custom have been founded on Scripture, 2 Tim. ii. 17. Psalm cxvi. 15. Rosweyde adds Ecclesiastic. xlii. 1. and takes these to have been the passages the ancient church had a view to, rather than the Sallian verses.

The profane diptycha were frequently sent as presents to princes, &c. on which occasion they were finely gilt, and embellished; as appears from Symmachus, lib. ii. ep. 81. Those presented were usually of ivory. The first laws, De Expend. Lador. C. Theod. forbids all magistrates below consuls to make presents of diptycha of ivory in the public ceremonies.

DIRCA, in botany: A genus of the monogynia order, belonging to the octandria class of plants; and in the natural method ranking under the 31st order, *Veprecule*. There is no clays; the corolla is tubular, with the limb indistinct; the stamina are longer than the tube; the berry is monopernous.

DIRÆ, the general name of the three Furies in the Pagan system of theology. They were so called, as being *quasi Deorum iræ*, the ministers of divine vengeance in punishing guilty souls after death. They were the daughters of *Night* and *Acheron*. See FURIES.

DIRECTION, in mechanics, signifies the line or path of a body's motion, along which it endeavours to proceed according to the force impressed upon it. See MECHANICS.

DIRECTOR, in commercial polity, a person who has the management of the affairs of a trading company: thus we say, the directors of the India company, South-sea company, &c. See COMPANY.

The directors are considerable proprietors in the stocks of their respective companies, being chosen by plurality of votes from among the body of proprietors. The Dutch East India company have 60 such directors; that of France, 21; the British East India company has 24, including the chairman, who may be re-elected for four years successively. These last have salaries of 150l. a-year each, and the chairman 200l. They meet at least once a-week, and commonly oftener, being summoned as occasion requires. The directors of the Bank of England are 24 in number, including governor and deputy governor.

DIRECTOR, in surgery, a grooved probe, to direct the edge of the knife or scissars in opening sinuses or fistula; that by this means the adjacent vessel, nerves, and tendons, may remain unhurt. See SURGERY.

DIRIBITORES, among the Romans, officers appointed to distribute tablets to the people at the comitia. See COMITIA.

DIRIGENT, or DIRECTRIX, a term in geometry, signifying the line of motion, along which the described line or surface is carried in the genesis of any plane or solid figure.

DIS, an inseparable article prefixed to divers words; the effect whereof is either to give them a signification contrary to what the simple words have, as *disobedience*, *disobey*, &c.; or to signify a separation, detachment, &c. as *disposing*, *distributing*.

DIS, a town of Norfolk, seated on the river Wavenay, on the side of a hill. It is a neat flourishing town, with one large church, a Presbyterian and a Quaker meeting. It has about 600 good houses, the streets are well paved, pretty wide, and always clean. At the west end of the town is a large meer or lake; but so muddy, that the inhabitants can make no other use of it but in catching of eels. In the town are carried on manufactories of sail-cloth, hose, and the making of flays. E. Long. 1. 16. N. Lat. 52. 25.

DIS, a god of the Gauls, the same as Pluto the god of hell. The inhabitants of Gaul supposed themselves descended from that deity.

DISA, in botany: A genus of the diandria order, belonging to the gynandria class of plants. The spathe is univalvular; the petals three; the third smaller than the rest, bifid, and gibbous at the base.

DISABILITY, in law, is when a man is disabled, or made incapable to inherit any lands, or take that benefit which otherwise he might have done: and this may happen four ways; by the act of an ancestor, or of the party himself; by the act of God, or of the law. 1. Disability by the act of the ancestor, is where the ancestor is attainted of high treason, &c. which corrupts the blood of his children, so that they may not inherit his estate. 2. Disability by the act of the party, is where a man binds himself by obligation, that, upon surrender of a lease, he will grant a new estate to a lessee; and afterwards he grants over the reversion to another, which puts it out of his power to perform it. 3. Disability by the act of God, is where a man is *non sana memoria*, whereby he is incapable to make any grant, &c. So that, if he passeth an estate out of him, it may after his death be made void; but it is a maxim in law, "That a man of full age shall never be received to disable his own person." 4. Disability by the act of the law, is where a man by the sole act of the law, without any thing by him done, is rendered incapable of the benefit of the law; as an alien born, &c.

DISANDRA, in botany: A genus of the digynia order, belonging to the heptandria class of plants. The calyx has seven leaves; the corolla parted into seven, and flat; the capsule two-celled.

ISLANDS OF DISAPPOINTMENT, are a cluster of small islands, lying in S. Lat. 14. 10. W. Long. 141. 16. They were discovered by Commodore Byron in 1765, who gave them their name from the shores affording no anchorage for his ships; for which reason he was obliged to quit them without landing, or procuring any refreshments for his crew, who were then languishing with sickness. They are inhabited by Indians, who appeared on the beach with spears in their hands, that were at least 16 feet long. They every where discovered hostile intentions, and seemed by signs to threaten the people in the boat with death if they came

Dirigent
Disappoint-
ment.

Disc
||
Discipline.

came ashore. There are cocoa-trees in great abundance, and the shore abounds with turtle.

DISC, in antiquity, a quilt made of stone, iron, or copper, five or six fingers broad, and more than a foot long, inclining to an oval figure, which they hurled in form of a bowl, to a vast distance, by the help of a leathern thong tied round the person's hand who threw it, and put through a hole in the middle. Homer has made Ajax and Ulysses great artists at this sport.

Disc, in astronomy, the body and face of the sun and moon, such as it appears to us on the earth; or the body and face of the earth, such as it appears to a spectator in the moon.

Disc, in optics, is the width of the aperture of telescopic glasses, whatever their form be, whether plain, convex, concave, &c.

DISCERNING, or DISCERNMENT, a faculty of the mind whereby it distinguishes between ideas. See METAPHYSICS.

DISCIPLE, one who learns any thing from another: thus, the followers of any teacher, philosopher, &c. are called *disciples*. In the Christian sense, they were followers of Jesus Christ, in general; but in a more restrained sense, the disciples denote those alone who were the immediate followers and attendants on his person, of which there were 70 or 72. The names *disciple* and *apostle* are often synonymously used in the gospel-history; but sometimes the apostles are distinguished from disciples, as persons selected out of the number of disciples, to be the principal ministers of his religion: of these there were only 12. The Latins kept the festival of the 70 or 72 disciples on July 15th, and the Greeks on January 4th.

DISCIPLINE, in a general sense, denotes instruction and government, as military discipline, ecclesiastical discipline, &c.

Ecclesiastical discipline consists in putting those laws in execution by which the church is governed, and inflicting the penalties enjoined by them against the several sorts of offenders that profess the religion of Jesus. The primitive church never pretended to exercise discipline upon any but such as were within her pale, in the largest sense, by some act of their own profession; and even upon these she never pretended to exercise her discipline so far as to cancel or disannul their baptism: all that the pretended to, was to deprive men of the benefits of external communion, such as public prayer, receiving the eucharist, and other acts of divine worship. The church-discipline was only confined to the admonition of the party, and to the lesser and greater excommunication.

As to the objects of ecclesiastical discipline, they were all such delinquents as fell into great and scandalous crimes after baptism.

Discipline, in a more peculiar sense, is used for the chastisements or bodily punishments inflicted on a religious of the Romish church who has been found a delinquent; or even for that which the religious voluntarily undergo or inflict on themselves, by way of modification.

Book of DISCIPLINE in the history of the church of Scotland, is a common order, drawn up by the assembly of ministers in 1650, for the reformation and

uniformity to be observed in the discipline and policy of the church. In this book the government of the church by prelates is set aside, church-festivals are established, the superstitious observation of fast-days and saints days is condemned, and other regulations for the government of the church are determined. This book was approved by the privy-council, and is called the *first book of discipline*.

DISCORD, in general, signifies disagreement, or opposition between different persons or things.

DISCORD, in music, every found which, joined with another, forms an assemblage disagreeable to the ear; or rather, every interval whose extremes do not coalesce. Now, as there are no other concords or consonances, except those which form amongst themselves, and with their fundamental found, perfect chords, it follows, that every other interval must be a real dissonance or discord: even the third and sixth were reckoned such among the ancients, who excluded them from the number of consonant chords.

The term *dissonance*, which is synonymous with discord, is compounded of two words, the inseparable preposition *dis* and the verb *sonare*; which, both in a literal and metaphorical sense, signifies *disagreement* or *disunion*. In reality, that which renders dissonances grating, is, that the sounds which form them, far from uniting in the ear, seem to repel each other, and are heard each by itself as two distinct sounds tho' produced at the same time.

This repulsion or violent oscillation of sounds is heard more or less as the vibrations which produce it are more or less frequently coincident. When two vocal strings are gradually tuned, till they approach a consonant interval, the pulsations become slower as the chord grows more just, till at last they are scarcely heard, if heard at all; from whence it appears certain, that the pleasure produced in us by harmony results from the more or less exact and frequent coincidence of vibrations; though the reason why this coincidence should give pleasure, more than any other modification or combination of sounds, appears to us inscrutable. The agreeable effects of dissonance in harmony, are no objection to this theory; since it is allowed, that the sensations excited by discord are not in themselves immediately and necessarily pleasing, but only please by auricular deception. The ear is surprised with the shock it receives, without being able to imagine how it should have happened; and in proportion as it is harsh and grating, we feel the pleasure of returning harmony enhanced, and the disappointment of being artfully and insensibly extricated more agreeable.

The name of *dissonance*, is given sometimes to the interval, and sometimes to each of the two sounds which form it. But though two sounds equally form a dissonance between themselves, the name is most frequently given to that found in particular which is most extraneous to the chord.

The number of possible dissonances is indefinite; but as in music we exclude all intervals which are not found in the system received, the number of dissonances is reduced to a very few: besides, in practice, we can only select from those few, such as are agreeable to the species, and the mode in which we compose; and from
this

Disord
||
Discount.

this last number we must exclude such as cannot be used consistently with the rules prescribed. But what are these rules? Have they any foundation in nature, or are they merely arbitrary? This is what Rousseau, whom in this article we have followed or abandoned as his observations appeared useful or frivolous, proposes to investigate as its principal object.

But where does his scrutiny terminate? Not in the abolition of the rules prescribed. These have still subsisted, and will still subsist, while the frame of man, and the nature of music, remain what they are. If then the rules be permanent and universal, the principle upon which they are founded may be latent or ambiguous; but the rules themselves can never be purely arbitrary. How else could it happen, that Rameau, D'Alembert, and Rousseau, should admit the force and effect of these rules, whilst each of those masters exerts his whole genius to give a different account of their cause and origin? Rousseau himself, as we have seen in a former article, inculcates the necessity of dissonances for the completion of harmony; (see CHORD). Now if this be true, the easiest methods of introducing and dismissing these dissonances must be the most eligible, and of consequence the rules for using them must be established. It is not then upon the subsistence or demolition of any particular theory that they depend. Should we attend to the particular objections which may be urged against any system whatever; where is the theory which will be found proof against the efforts of scepticism? After all, the objections of Rousseau against Rameau's theory, as applied by D'Alembert to the origin of consonances, (see MUSIC, art. 94, 95, 96, 97, 98, 99,) appear to be much more frivolous than the analogies from which he pretends this origin to be deduced. It appears from D'Alembert's exposition of this theory, that, if not for all, it affords a solution for the most material and essential phenomena in harmony; which is sufficient for its establishment, till another can be found, which gives a rational and consistent account of the whole: a discovery which has not yet been made. But, whilst we acknowledge the futility of Rousseau's objections against D'Alembert's explication of dissonances, we must at the same time admire the ingenuity with which he has deduced them from principles purely mechanical, without departing from the system of M. Rameau. This mechanical explication will be found in his Musical Dictionary, under the article *Dissonance*.

DISCORD, (the goddess of), in Pagan theology. She is represented by Aristides with fiery eyes, a pale countenance, livid lips, and wearing a dagger in her bosom. It was she who at the marriage of Peleus and Thetis threw in the golden apple, whereon was written "To the fairest;" which occasioned a contention between the goddesses Juno, Minerva, and Venus; each pretending a title to the apple. She was likewise called *Ate* and *Eris*.

DISCOVERY, in dramatic poetry, a manner of unravelling a plot or fable in tragedies, comedies, and romances; wherein, by some unforeseen accident, a discovery is made of the name, fortune, quality, &c. of a principal person, which were before unknown. See CATASTROPHE.

DISCOUNT, in commerce, a term among traders, merchants, and bankers. It is used by the two former
N^o 102.

Discrete,
Discretion.

on occasion of their buying commodities on the usual time of credit, with a condition that the seller shall allow the buyer a certain discount at the rate of so much *per cent. per annum*, for the time for which the credit is generally given, upon condition that the buyer pays ready money for such commodities, instead of taking the time of credit. Traders and merchants also frequently taking promissory notes for moneys due payable to them or order at a certain time, and sometimes having occasion for money before the time is elapsed, procure these notes to be discounted by bankers before the time of payment. Bills of exchange are also discounted by bankers; and in this consists one article of the profits of banking. See BANK.

DISCRETE, or DISJUNCT, PROPORTION, is when the ratio of two or more pairs of numbers or quantities is the same, but there is not the same proportion between all the four numbers. Thus if the numbers 3 : 6 :: 8 : 16 be considered, the ratio between 3 : 6 is the same as that between 8 : 16, and therefore the numbers are proportional: but it is only discretely or disjunctly, for 3 is not to 6 as 6 to 8; that is, the proportion is broken off between 6 and 8, and is not continued as in the following continual proportionals, 3 : 6 :: 12 : 24.

DISCRETION, prudence, or knowledge to govern one's self.

There are many more shining qualities in the mind of man, but there is none so useful as discretion; it is this indeed that gives a value to all the rest, which sets them at work in their proper times and places; and turns them to the advantage of the person who is possessed of them. Without it learning is pedantry, and wit impertinence; virtue itself looks like weakness; the best parts only qualify a man to be more sprightly in errors, and active to his own prejudice.

Nor does discretion only make a man master of his own parts, but of other men's. The discreet man finds out the talents of those he converses with, and knows how to apply them to proper uses. Accordingly, if we look into particular communities and divisions of men, we may observe that it is the discreet man, not the witty, nor the learned, nor the brave, who guides the conversation, and gives measures to the society. A man with great talents, but void of discretion, is like Polyphemus in the fable, strong and blind, endued with an irresistible force, which for want of sight is of no use to him. Though a man has all other perfections, and wants discretion, he will be of no great consequence in the world; but if he has this single talent in perfection, and but a common share of others, he may do what he pleases in his particular station of life.

It is proper, however, to distinguish between *discretion* and *cunning*, the latter being the accomplishment only of little mean ungenerous minds. Discretion points out the noblest ends to us, and pursues the most proper and laudable methods of attaining them: cunning has only private selfish aims, and sticks at nothing which may make them succeed. Discretion has large and extended views, and, like a well-formed eye, commands a whole horizon: cunning is a kind of short-sightedness, that discovers the minutest objects which are near at hand, but is not able to detect things at a distance. Discretion, the more it is discovered, gives the greater authority to the person who possesses it: cunning,

Disease
Disease

cunning, when it is once detected, loses its force, and makes a man incapable of bringing about even those events which he might have done, had he passed only for a plain man. Discretion is the perfection of reason, and a guide to us in all the duties of life; cunning is a kind of instinct, that only looks out after our immediate interest and welfare. Discretion is only found in men of strong sense and good understanding; cunning is often to be met with in brutes themselves, and in persons who are but the fewest removes from them. In short, cunning is only the mimic of discretion, and may pass upon weak men, in the same manner as vivacity is often mistaken for wit, and gravity for wisdom.

DISCUS, in antiquity. See Disc.

Discus, in botany, the middle part of a radiated compound flower, generally consisting of small florets, with a hollow regular petal. It is commonly surrounded by large, plain, or flat, tongue-shaped petals, in the circumference or margin; as in daisy, groundsel, and leopards bane: sometimes the circumference is naked, as in cotton-weed and some species of colts-foot.

Discus Folii, the surface of the leaf.

DISCUSSION, in matters of literature, signifies the clear treating or handling of any particular point, or problem, so as to shake off the difficulties with which it is embarrassed: thus we say, *such a point was well discussed*, when it was well treated of and cleared up.

DISCUTIENTS, in medicine, are such remedies, as, by their subtilty, dissolve a stagnating or coagulated fluid, and dissipate the same without an external solution of continuity.

DISDIACLASTIC CRYSTAL, in natural history, a name given, by Bartholine and some others, to the pellucid fossil substance, more usually called, from the place whence it was first brought, *Island crystal*; tho' properly it is no crystal at all, but a fine pellucid spar, called by Dr Hill, from its shape, *parallelepipedum*. See *Island Crystal*.

DISDIAPASON, or BISDIAPASON, in music, a compound concord, described by F. Parran, in the quadruple ratio of 4 : 1, or 8 : 2.

DISDIAPASON Diapente, a concord in a sextuple ratio of 1 : 6.

DISDIAPASON Semi-Diapente, a compound concord in the proportion of 16 : 3.

DISDIAPASON Diitone, a compound consonance in the proportion of 10 : 2.

DISDIAPASON Semi-Ditone, a compound concord in the proportion of 24 : 5.

DISEASE, has been variously defined by physicians, almost every founder of a new system having given a definition of *disease*, differing in some respects from his predecessors. For a particular account of these definitions, see *Medicine*.

Of all animals, man is subject to the most diseases; and of men, the studious and speculative are most exposed thereto. Other animals have their diseases; but they are in small number: nor are plants without them; though their maladies scarce exceed half a score. The ancients deified their diseases. Some diseases only impair the use of the part immediately affected; as the ophthalmia, gout, &c. Others destroy it entirely; as

the *gutta serena*, palsy, &c. Some affect the whole body; as the fever, apoplexy, epilepsy, &c. Others only impair a part; as the asthma, colic, dropsy, &c. Some only affect the body; as the gout: others disturb the mind; as melancholy, delirium, &c. Lastly, others affect both the body and mind; as the mania, phrensy, &c.

The colder the country, in general, the fewer and the less violent are the diseases. Scheffer tells us that the Laplanders know no such thing as the plague, or fevers of the burning kind, nor are subject to half the distempers we are. They are robust and strong, and live to 80, 90, and many of them to more than 100 years; and at this great age they are not feeble and decrepid as with us; but a man of 90 is able to work or travel as well as a man of 60 with us. They are subject, however, to some diseases more than other nations: thus they have often distempers of the eyes, which is owing to their living in smoke, or being blinded by the snow. Pleuritis and inflammations of the lungs are also very frequent among them; and the small-pox often rages with great violence. They have one general remedy against these and all other internal diseases: this is the root of that sort of moss, as Scheffer expresses it, which they call *jerib*. They make a decoction of this root in the whey of rein-deer milk, and drink very large doses of it warm, to keep up a breathing sweat; if they cannot get this, they use the stalks of angelica boiled in the same manner: they have not so great an opinion of this as of the other remedy; but the keeping in a sweat, and drinking plentifully of diluting liquors, may go a great way in the cure of their diseases, whether either the one or the other of the drugs have any virtue or not. They cure pleuritis by this method in a very few days; and get so well through the small-pox with it, that very few die of it.

It has been always observed, that people of particular places were peculiarly subject to particular diseases, which are owing to their manner of living, or to the air and effluvia of the earth and waters. Hoffman has made some curious observations on diseases of this kind. He observes, that swellings of the throat have always been common to the inhabitants of mountainous countries: and the old Roman authors say, Who wonders at a swelled throat in the Alps? The people of Switzerland, Carnythia, Styria, the Hartz forest, Transylvania, and the inhabitants of Cronstadt, he observes, are all subject to this disease from the same cause.

The French are peculiarly troubled with fevers, with worms, and with hydroceles and sarcoceles; and all these disorders seem to be owing originally to their eating very large quantities of chefnuts. The people of our own nation are peculiarly afflicted with hoarsenesses, catarrhs, coughs, dysenteries, consumptions, and the scurvy; and the women with the *fluor albus* or whites; and children with a disease scarce known elsewhere, which we call the *rickets*. In different parts of Italy different diseases reign. At Naples the venereal disease is more common than in any other part of the world. At Venice, people are peculiarly subject to the bleeding piles. At Rome, tertian agues and lethargic distempers are most common. In Tuscany, the epilepsy or falling sickness. And in Apulia they are most subject to burning fevers, pleuritis, and to that sort of madness which is attributed to the bite of the tarantula,

Disease.

Disease
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Disjunctive.

and which, it is said, is only to be cured by music. In Spain apoplexies are common, as also melancholy, hypochondriacal complaints, and bleeding piles. The Dutch are peculiarly subject to the scurvy, and to the stone in the kidneys. Denmark, Norway, Sweden, Pomerania, and Livonia, are all terribly afflicted with the scurvy: and it is remarkable, that in Denmark, Sweden, and Norway, fevers are very common; but in Iceland, Lapland, and Finland, there is scarce ever such a disease met with; though peripneumonies are very common in these places, as also diseases of the eyes and violent pains of the head. The Russians and Tartars are afflicted with ulcers, made by the cold, of the nature of what we call chilblains, but greatly worse; and in Poland and Lithuania there reigns a peculiar disease called the *plaga polonica*, so terribly painful and offensive, that scarce any thing can be thought of worse. The people of Hungary are very subject to the gout and rheumatism: they are more infested also with lice and fleas than any other people in the world, and they have a peculiar disease which they call *cremor*. The Germans, in different parts of the empire, are subject to different reigning diseases. In Westphalia, they are peculiarly troubled with peripneumonies and the itch. In Silesia, Franconia, Austria, and other places thereabout, they are very liable to fevers of the burning kind, to bleedings at the nose, and other hemorrhages; and to the gout, inflammations, and consumptions. In Misnia they have purple fevers; and the children are peculiarly infested with worms. In Greece, Macedonia, and Thrace, there are very few diseases; but what they have are principally burning fevers and phrenzies. At Constantinople the plague always rages; and in the West Indian islands, malignant fevers, and the most terrible colics. These diseases are called *endemic*.

DISEASES of Horses. See FARRIERY.

DISEASES of Dogs. See DOGS.

DISEASES of Plants. See AGRICULTURE, no 69, *at seq.* and BLIGHT, MILDEW, &c.

DISEMBOGUE. When a ship passes out of the mouth of some great gulf or bay, they call it *disemboguing*. They say also of a river, that at such a place, or after it has run so many leagues, it disemboignes itself into the sea.

DISFRANCHISING, among civilians, signifies the depriving a person of the rights and privileges of a free citizen or subject.

DISGUISE, a counterfeit habit. Persons doing unlawful acts in disguise are by our statutes sometimes subjected to great penalties, and even declared felons. Thus by an act, commonly called the *black act*, persons appearing disguised and armed in a forest or grounds inclosed, or hunting deer, or robbing a warren or a fish-pond, are declared felons.

DISH, in mining, is a trough made of wood, about 28 inches long, four inches deep, and six inches wide; by which all miners measure their ore. If any be taken selling their ore, not first measuring it by the bar-master's dish, and paying the king's duty, the seller forfeits his ore, and the buyer forfeits for every such offence 40 shillings to the lord of the field or farmer.

DISJUNCTIVE, something that separates or disjoins. Thus, *or, neither, &c.* which in connecting a

discourse yet separates the parts of it, are called *disjunctive conjunctions*.

DISK. See DISC.

DISLOCATION, the putting a bone out of joint by some violence, usually called by the physicians *luxation*.

DISMISSION of a BILL, in chancery. If the plaintiff does not attend on the day fixed for the hearing, his bill is dismissed with costs. It may be also dismissed for want of prosecution, which is in the nature of a non-suit at law, if she suffers three terms to elapse without moving forward in the cause.

DISMOUNTING, in the military art, the act of unhorsing. Thus, to dismount the cavalry, the dragoons, or the like, is to make them alight. To dismount the cannon, is to break their carriages, wheels, and axletrees, so as to render them unfit for service. Horses are also dismounted when they are rendered unfit for service.

DISPARAGEMENT, in law, is used for the matching an heir, &c. in marriage, below his or her degree or condition, or against the rules of decency. The word is a compound of the privative particle *dis*, and *par*, "equal."

DISPART, in gunnery, is the setting a mark upon the muzzle-ring, or thereabouts, of a piece of ordnance, so that a sight-line taken upon the top of the base-ring against the touch-hole, by the mark set on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing this, is to take the two diameters of the base ring, and of the place where the dispart is to stand, and divide the difference between them into two equal parts, one of which will be the length of the dispart which is set on the gun with wax or pitch, or fastened there with a piece of twine or marlin. By means of an instrument it may be done with all possible nicety.

DISPATCH, a letter on some affair of state, or other business of importance, sent with care and expedition, by a courier express. The business of dispatches lies on the secretaries of state and their clerks. The king gives directions to his ministers abroad by dispatches. The word is also used for the packet or mail containing such letters. The French, during the reign of Louis XIV. had a *conseil des depêches*, "council of dispatches," held in the king's presence, at which the dauphin, the duke of Orleans, the chancellor, and four secretaries of state, assisted.

DISPAUPER. A person suing in *forma pauperis*, is said to be dispaupered, if, before the suit is ended, he has any lands or other estate fallen to him, or if he has any thing to make him lose his privilege. See the article *FORMA PAUPERIS*.

DISPENSARY, or DISPENSATORY, denotes a book containing the method of preparing the various kinds of medicines used in pharmacy. Such are those of Bauderon, Quercetan, Zwelfer, Charas, Bates, Mesue, Salmon, Lemery, Quincy, &c. but the latest and most esteemed, beside the London and Edinburgh Pharmacopœias, is the Edinburgh New Dispensatory, being an improvement upon that of Dr Lewis's.

DISPENSARY, or Dispensatory, is likewise a magazine or office for selling medicines at prime cost to the poor. The college of physicians maintain three of these in London; one at the college itself in Warwick-lane;

Disks
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Dispensary

lane; another in St Peter's alley, Cornhill; and a third in St Martin's lane. Dispensaries have also been established in several of the principal towns in Scotland and England; particularly in Edinburgh, Dundee, and Kello; as also at Newcastle upon Tyne.

DISPENSATION, in law, the granting a licence of doing some certain action that otherwise is not permitted.

DISPERSION, in general, signifies the scattering or dissipating something. Hence

Dispersion, in optics, the same with the divergence of the rays of light.

Point of Dispersion, in dioptrics, the point from which refracted rays begin to diverge, where their refraction renders them divergent.

Dispersion of Inflammation, in medicine and surgery, is the removing the inflammation, and restoring the inflamed part to its natural state.

Dispersion of Mankind, in the history of the world, was occasioned by the confusion of tongues, and took place in consequence of the overthrow of Babel at the birth of Peleg; whence he derived his name: and it appears by the account given of his ancestors, Gen. chap. xi. 10—16, to have happened in the 101st year after the flood according to the Hebrew chronology, and by the Samaritan computation in the 401st. However, various difficulties have been suggested by chronologers concerning the true era of this event. Sir John Marsham and others, in order to reconcile the Hebrew and Egyptian chronologies, maintain a dispersion of mankind before the birth of Peleg. Others, unable to find numbers sufficient for the plantation of colonies in the space of 101 years, according to the Hebrew computation, fix the dispersion towards the end of Peleg's life, thus following the computation of the Jews. Petavius assigns the 153d year after the flood; Cumberland the 180th; and Usher, though he generally refers it to the time of Peleg's birth, in one place assigns the 131st after the flood for this event. Mr Shuckford supposes the dispersion to have been gradual, and to have commenced with the separation of some companies at the birth of Peleg, and to have been completed 31 years after. According to the calculation of Petavius, the number of inhabitants on the earth at the birth of Peleg amounted to 32,768; Cumberland makes them 30,000: Mr Mede states them at 7000 men, besides women and children: and Mr Whiston, who supposes that mankind now double themselves in 400 years, and that they doubled themselves between the deluge and the time of David in 60 years at a medium, when their lives were six or seven times as long as they have been since, by his computation products about 2389; a number much too inconsiderable for the purposes of separating and forming distinct nations. This difficulty induced Mr Whiston to reject the Hebrew and to adopt the Samaritan chronology, as many others have done; which, by allowing an interval of 401 years between the flood and the birth of Peleg, furnishes, by the last mentioned mode of computation, more than 240,000 persons.

As to the manner of the dispersion of the posterity of Noah from the plain of Shinar, it was undoubtedly conducted with the utmost regularity and order. The sacred historian informs us, that they were divided in their lands; every one according to his tongue, ac-

ording to his family, and according to his nation, Gen. x. 5, 20, 31: and thus, as Mr Mede observes, they were ranged according to their nations, and every nation was ranged by their families; so that each nation had a separate lot, and each family in every nation. The following abstract will serve to give a general idea of their respective settlements: Japhet, Noah's eldest son, had seven sons; *viz.* Gomer, whose descendants inhabited those parts of Asia which lie upon the *Ægean* Sea and *Hellepont* northward, containing Phrygia, Pontus, Bithynia, and a great part of Galatia. The Galatians, according to Josephus, were called *Gomerai*; and the Cimmeri, according to Herodotus, occupied this tract of country: and from these Gomerians, Cimmeri, or Celts, Mr Camden derives our ancient Britons, who still retain the name *Cymro* or *Cymru*. Magog, the second son of Japhet, was probably the father of the Scythians on the east and north-east of the *Euxine* Sea. Madaj planted Media, though Mr Mede assigns Macedonia to his share. Javan was the father of the Grecians about Ionia, whose country lies along upon the *Mediterranean* Sea; the radicals of Javan and Ionia being the same. To Tubal and Meshech belonged Cappadocia and the country which lies on the borders of the *Euxine* Sea; and from them, migrating over the Caucasus, it is supposed the Russians and Moscovites are descended. And Tiras occupied Thrace. The sons of Shem were five: Elam, whose country lay between the Medes and Mesopotamians, and was called by the Gentile writers *Elymais*; and Josephus calls the Elamites the founders of the Persians: Ashur, who was driven out of Shinar by Nimrod, afterwards settled in Assyria, and there built Nineveh and other cities: Arphaxad, who gave name to the country which Ptolemy calls *Arraphacitis*, a province of Assyria, though Josephus makes him the father of the Chaldees: Lud, who inhabited and gave name to the country of Lydia about the river *Mæander*, remarkable for its windings, in Asia Minor; and Aram, the father of the Syrians. Ham, the youngest son of Noah, had four sons; *viz.* Cush, whose posterity spread into the several parts of Arabia, over the borders of the land of Edom, into Arabia Felix, up to Midian and Egypt: Mizraim, the father of them who inhabited Egypt and other parts of Africa: Phut, to whom Bochart assigns the remaining part of Africa, from the lake Tritonides to the Atlantic Ocean, called *Lybia*; and Canaan, to whom belonged the land of Canaan, whence the Phœnicians derived their origin.

Dr Bryant has advanced a new hypothesis on this subject, and supported it with his usual acuteness and learning. He maintains, that the dispersion as well as the confusion of tongues was local, and limited to the inhabitants of the province of Babel; that the separation and distribution recorded to have taken place in the days of Peleg, Gen. x. 25, 31, 32, which was the result of Divine appointment, occasioned a general migration; and that all the families among the sons of men were concerned in it. The house of Shem, from which the Messiah was to spring, was particularly regarded in this distribution; the portion of his children was near the place of separation; they in general had Asia to their lot; as Japhet had Europe, and Ham the large continent of Africa. But the sons of Chus would not

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Disquisition.

submit to the divine dispensation; they went off under the conduct of Nimrod, and seem to have been for a long time in a roving state. However, at last they arrived at the plains of Shinar; and having ejected Aſhur and his sons, who were placed there by Divine appointment, seized his dominions, and laid there the foundation of a great monarchy. But afterwards fearing left they should be divided and scattered abroad, they built the tower of Babel as a landmark to which they might repair; and probably to answer the purposes of an idolatrous temple, or high altar, dedicated to the host of heaven, from which they were never long to be absent. They only, *viz.* the sons of Chus or the Cuthites, and their associates from other families, who had been guilty of rebellion against divine authority, and of wicked ambition and tyranny, were punished with the judgment of confounded speech through a failure in labial utterance, and of the dispersion recorded in Gen. x. 8, 9: in consequence of which they were scattered abroad from this city and tower, without any certain place of destination. The Cuthites invaded Egypt or the land of Mizraim in its infant state, seized the whole country, and held it for some ages in subjection; and they extended likewise to the Indies and Ganges, and still farther into China and Japan. From them the province of Cuthan or Goshen in Egypt derived its name. Here they obtained the appellation of *royal shepherds*; and when they were by force driven out of the country, after having been in possession of it for 260 or 280 years, the land which they had been obliged to quit was given to the Israelites, who were also denominated *shepherds*, but should not be confounded with the former or the antedecent inhabitants of Goshen.

DISPLAYED, in heraldry, is understood of the position of an eagle, or any other bird, when it is erect, with its wings expanded or spread forth.

DISPONDEE, in the Greek and Latin poetry, a double spondee or foot, consisting of four long syllables; as *maëcénatēs*, *conclūdētēs*.

DISPOSITION, in Scots law, is that deed or writing which contains the sale or grant of any subject: when applied to heritable subjects, it in some cases gets the name of *charter*, which differs from a disposition in nothing else than a few immaterial forms.

DISPOSITION, in architecture, the just placing the several parts of an edifice according to their nature and office. See ARCHITECTURE, n° 31, &c.

DISPOSITION, in oratory. See ORATORY, Part I.

DISPOSITION, in painting. See PAINTING.

DISPOSITION, in human nature.—In every man there is something original, that serves to distinguish him from others, that tends to form a character, and to make him meek or fiery, candid or deceitful, resolute or timorous, cheerful or morose. This original bent, termed *dispositio*, must be distinguished from a *principle*: the latter, signifying a law of human nature, makes part of the common nature of man; the former makes part of the nature of this or that man. *Propensity* is a name common to both; for it signifies a principle as well as a disposition.

DISQUISITION (from *dis* and *quero* “I inquire”), an inquiry into the nature, kinds, and circumstances of any problem, question, or topic; in or-

der to gain a right notion of it, and to discourse clearly about it.

DISSECTION, in anatomy, the cutting up a body with a view of examining the structure and use of the parts. See ANATOMY.

Le Gendre observes, that the dissection of a human body, even dead, was held a sacrilege till the time of Francis I. And the same author assures us, he has seen a consultation held by the divines of Salamanca, at the request of Charles V. to settle the question whether or no it were lawful in point of conscience to dissect a human body in order to learn the structure thereof.

DISSEISIN, in law, an unlawful dispossessing a person of his lands or tenements.

DISSEPPMENTUM, in botany, the name by which Linnæus denominates the partitions which in dry seed-vessels, as capsules and pods (*siliqua*), divide the fruit internally into cells.

DISSENTERS, separatists from the service and worship of any established church.

DISSIDENTS, a denomination applied in Poland to those of the Lutheran, Calvinistic, and Greek profession. The king of Poland engages by the *pacta conventa* to tolerate them in the free exercise of their religion, but they have often had reason to complain of the violation of these promises. See (*History of*) POLAND.

DISSIMILITUDE, unlikeness or want of similitude. See the article RESEMBLANCE and *dissimilitude*.

DISSIMULATION, in morals, the act of dissimulating, by fallacious appearances, or false pretensions.

Good princes regard dissimulation as a necessary vice; but tyrants consider it as a virtue.

It is apparent that secrecy is often necessary, to oppose those who may be willing to circumvent our lawful intentions. But the necessity of precaution would become very rare, were no enterprizes to be formed, but such as could be avowed openly. The frankness with which we could then act, would engage people in our interests. Marshal Biron would have saved his life, by dealing ingeniously with Henry IV.

With respect to dissimulation, three things are to be observed; 1. That the characters of those are not to be esteemed, who are reserved and cautious without distinction. 2. Not to make secrets of unimportant matters. 3. To conduct ourselves in such manner, as to have as few secrets as possible.

DISSIPATION, in physics, an insensible loss or consumption of the minute parts of the body; or that flux whereby they fly off, and are lost.

Circle of DISSIPATION, in optics, is used for that circular space upon the retina, which is taken up by one of the extreme pencils or rays issuing from an object.

DISSOLVENT, in general, whatever dissolves or reduces a solid body into such minute parts as to be sustained in a fluid.

The principal dissolvents for metals are aqua-regia and aqua-fortis; for salts, earths, and gums, water for coral, and other alkaline substances, distilled vinegar or spirits of wine. Dissolvents are the same with what the chemists call *menstruums*. See the article MENSTRUUM.

Diffolvent,
Dissolution.

Universal Dissolvent. See the article ALKALINEST. DISSOLUTION, in physics: a discontinuation, or analysis, of the structure of a mixed body; whereby, what was one, and contiguous, is divided into little parts, either homogeneous or heterogeneous.

Dissolution, then, is a general name for all reductions of concrete bodies into their smallest parts, without any regard either to solidity or fluidity: though in the usual acceptation of the word among authors, it is restrained to the reduction of solid bodies into a state of fluidity; which is more properly expressed by *solution*, as a branch of *dissolution*.

According to the opinion of Fr. Tertius de Lanis, Boerhaave, and some other learned men, the power or faculty of dissolving is lodged in fire alone. See FIRE and HEAT.

According to this hypothesis, other fluids commonly supposed diffolvents, only produce their effect by means of the fiery spicula they abound with; and even air, which is judged a powerful menstruum, owes all its force to the rays of light diffused therein.

Sir Isaac Newton accounts for all dissolutions, and the several phenomena thereof, from the great principle of attraction; and, in effect, the phenomena of dissolution furnish a great part of the arguments and considerations whereby he proves the reality of that principle. The following is a specimen of that great author's way of philosophizing on the subject of dissolution.

"When salt of tartar dissolves by lying in a moist place, is not this done by an attraction between the particles of the salt of tartar and those of the water which float in the air in form of vapours? and why does not common salt, or salt-petre, or vitriol, do the like, but for want of such an attraction? And when aqua-fortis, or spirit of vitriol, poured on steel-silings, dissolves the filings with a great heat and ebullition; is not this heat and ebullition effected by a violent motion of the parts? and does not that motion argue, that the acid parts of the liquor rush towards the parts of the metal with violence, and run forcibly into its pores; till, getting between the utmost particles and the main mass of metal, they loosen them therefrom, and set them at liberty to float off into the water? When a solution of iron in aqua-fortis dissolves lapis calaminaris, and lets go the iron; or a solution of copper dissolves iron immersed in it, and lets go the copper; or a solution of mercury in aqua-fortis poured on iron, copper, tin, or lead, dissolves the metal, and lets go the mercury; does not this argue, that the acid particles of the aqua-fortis are attracted more strongly by the lapis calaminaris than by iron; by iron than by copper; by copper than by silver; and by iron, copper, tin, and lead, than by mercury? And is it not for the same reason, that iron requires more aqua-fortis to dissolve it than copper, and copper more than the other metals; and that of all metals iron is dissolved most easily, and is most apt to rust; and next after iron, copper? When aqua-fortis dissolves silver, and not gold; and aqua-regia dissolves gold, and not silver; may it not be said, that aqua-fortis is subtle enough to penetrate the pores of gold as well as of silver, but wants the attractive force to give it entrance; and the same of aqua-regia and silver? And when metals are dissolved in acid menstrua, and the acids in conjunction with the metal

act after a different manner, so as that the taste of the compound is milder than that of the simples and sometimes a sweet one; is it not because the acids adhere to the metallic particles, and thereby lose much of their activity? And if the acid be in too small a proportion to make the compound dissoluble in water; will it not, by adhering strongly to the metal, become unactive, and lose its taste, and the compound become a tasteless earth? for such things as are not dissoluble by the moisture of the tongue are insipid."

Dr Freind gives us a mechanical account of dissolution, in the instance of salt dissolved in water, which is the most simple operation that falls under this head. This motion he ascribes to that attractive force, which is so very extensive in natural philosophy, that there is no kind of matter but what is under its influence. It may be observed, says he, that the corpuscles of salts, which are the most simple of any, are withal very minute, and for their bulk very solid; and therefore exert a very strong attractive force, which, *ceteris paribus*, is proportional to the quantity of matter. Hence it comes to pass, that the particles of water are more strongly attracted by the saline particles than they are by one another: the particles of water, therefore, cohering but loosely, and being easily moveable, approach the corpuscles of salts, and run, as it were, into their embraces: and the motion of them is quicker or slower, according to their less or greater distances; the attractive force in all bodies being strongest, at the point of contact. Therefore, if salt be thrown into the middle of a dish full of water, we shall find the aqueous particles which are in the middle of the dish sharp and pungent to the taste, but the water upon the sides of the vessel almost insipid; so that, when such a motion once arises, the aqueous particles are carried with an equal force towards the salts, and the moment of them is to be estimated from the ratio of their weight and celerity conjunctly. By the force of this impulse, they open to themselves a passage into the pores of the salts, which are very numerous; and at length so break and divide their texture, that all cohesion of their parts is destroyed: hereupon, being separated, and removed to a convenient distance from one another, they are dispersed, and float here and there about the water.

The simple dissolution of saline substances of every kind in water, may indeed be plausibly enough explained on the hypothesis of attraction; but where the dissolution is attended with heat, the emission of vapour, &c. it seems necessary to seek for some other principle than mere attraction to solve these phenomena. When diluted oil of vitriol, for instance, is poured upon iron-silings, a great quantity of vapour arises, which, if it was attempted to be confined, would certainly break the containing vessel.—It is impossible to imagine any connection between attraction and the emission of a vapour; and what is still more unaccountable, this vapour is inflammable, though neither the oil of vitriol nor the iron are so by themselves. Another very strong objection against the hypothesis of attraction may be derived from the phenomena of metallic dissolutions in general; for they do not dissolve completely in acids, as salts do in water. By dissolution they are always decomposed, and cannot be recovered in their proper form without a good deal of trouble.

Dissolution.

Dissolution. trouble. One metal, indeed, will very often precipitate another from an acid in its metallic form; but this is attended with the decomposition of the second metal; so that this can by no means be reckoned a fair experiment. But, whatever other method is used, the dissolved metal is always recovered in form of an earthy powder, that we could scarcely imagine capable of ever becoming malleable, and assuming the splendid appearance of a metal. Now, if there was a strong attraction between this and the acid, we might very justly conjecture, that the dissolution happened by means of that attraction; but so far from this, after a metal has been dissolved by any acid, and the calx has been separated from it, it is always difficult, and very often impossible, to procure a dissolution of the calx in the same acid. The action of the acid in this case seems not unlike that of fire upon wood or any other inflammable substance. Dry wood, thrown into the fire, burns and flames with great violence; but the same wood reduced to ashes, instead of burning, extinguishes fire already kindled. In like manner, a piece of clear metal thrown into an acid, dissolves with great violence: but the same metal, deprived of its phlogistic principle, and reduced to a calx, cannot be acted upon by acids, in whatever manner they are applied; at least, not without the greatest difficulty; and the more perfect the calx is, *i. e.* the more completely it is deprived of its inflammable principle, the greater the difficulty is of combining it afterwards with an acid.

Another thing in which the dissolution of metals by an acid resembles the burning of combustibles by fire is, that in both cases there is a separation of the principle of inflammability. In the case of oil of vitriol and iron-slings, this is exceedingly obvious; for there the vapour which arises from the mixture takes fire, and explodes with great vehemence. In all other cases it is very easily proved; for the calx is always capable of being revived into metal by the addition of any substance containing phlogiston. The calces prepared by fire, and by precipitation from acids, also resemble one another so much, that in many cases they are scarce to be distinguished.

These considerations seem to favour the hypothesis of Dr Boerhaave; and much more does the following, namely, that almost all metallic solutions produce some degree of sensible heat. In some metals this is very considerable; but the greatest heat producible by an aqueous solution of any substance is by dissolving quicklime in the nitrous acid. The heat here greatly exceeds that of boiling water. In some dissolutions of inflammable matters by a mixture of the vitriolic and nitrous acids, the heat is so great, that the whole mixture takes fire almost instantaneously. Hence the Boerhaavians think they have sufficient grounds to conclude, that fire alone is the agent by which all dissolutions are performed.

These appearances have also been explained on the principles of attraction; and it has been said, that the heat, &c. were owing to nothing but the violent action of the particles of the acid and metal upon each other. But the late discoveries made by Dr Black, with regard to heat, show, that it is capable of remaining concealed in substances for any length of time, and af-

terwards breaking out in its proper form. It is probable, therefore, that the heat produced in these dissolutions is no other than what existed before, either in the acid or in the metal. But for a full discussion of this subject see the articles COLD, CONGELATION, EVAPORATION, FIRE, HEAT, &c.

DISSONANCE, in music. See DISCORD.

DISSYLLABLE, among grammarians, a word consisting only of two syllables: such are nature, science, &c.

DISTAFF, an instrument about which flax is tied in order to be spun.

DISTANCE, in general, an interval between two things, either with regard to time or place. See METAPHYSICS.

Accessible DISTANCES, in geometry, are such as may be measured by the chain, &c. See GEOMETRY.

Inaccessible DISTANCES, are such as cannot be measured by the chain, &c. by reason of some river, or the like, &c. which obstructs our passing from one object to another. See GEOMETRY.

DISTANCE, in astronomy. The distance of the sun, planets, and comets, is found only from their parallax, as it cannot be found either by eclipses or their different phases: for from the theory of the motions of the earth and planets we know, at any time, the proportion of the distances of the sun and planets from us; and the horizontal parallaxes are in a reciprocal proportion to these distances. See ASTRONOMY.

DISTASTE properly signifies an aversion or dislike to certain foods; and may be either constitutional, or owing to some disorder of the stomach.

DISTEMPER, among physicians, the same with DISEASE.

DISTEMPER, in painting, a term used for the working up of colours with something besides water or oil. If the colours are prepared with water, that kind of painting is called *limning*; and if with oil, it is called *painting in oil*, and simply *painting*. If the colours are mixed with size, whites of eggs, or any such proper glutinous or unctuous matter, and not with oil, then they say it is done in *distemper*.

DISTENSION, in general, signifies the stretching or extending a thing to its full length or breadth.

DISTICH, a couplet of verses making a complete sense. Thus hexameter and pentameter verses are disposed in distichs. There are excellent morals in Cato's distichs.

DISTICHIASIS, in surgery, a disease of the eyelids, when under the ordinary eye-lashes there grows another extraordinary row of hair, which frequently eradicates the former, and, pricking the membrane of the eye, excites pain, and brings on a defluxion.—It is cured by pulling out the second row of hairs with nippers, and cauterizing the pores out of which they issued.

DISTILLATION. See CHEMISTRY, Index.

The objects of distillation, considered as a trade distinct from the other branches of chemistry, are chiefly spirituous liquors, and those waters impregnated with the essential oil of plants, commonly called *simple distilled waters*. The distilling compound spirits and waters are reckoned a different branch of business, and they who deal in that way are commonly called *redifiers*. This Difference between distillers and redifiers.

Distillation

This difference, however, though it exists among commercial people, is not at all founded in the nature of the thing; compound spirits being made, and simple spirits being rectified, by the very same operations by which they are at first distilled, or at least with very trifling alterations.

2
Spirits perfectly flavoured, how obtained.

The great object with every distiller ought to be, to procure a spirit perfectly flavourless, or at least as well freed from any particular flavour as may be; and in this country the procuring of such a spirit is no easy matter. The only materials for distillation that have been used in large quantity, are malt and molasses or treacle. Both of these, especially the first, abound with an oily matter, which, rising along with the spirit, communicates a disagreeable flavour to it, and from which it can scarce be freed afterwards by any means whatever.—Some experiments have been made upon carrots, as a subject for the distillers: but these are not as yet sufficiently decisive; nor is it probable, that a spirit drawn from carrots would be at all devoid of flavour, more than one drawn from malt.—To dissipate the essential oil which gives the disagreeable flavour to malt spirits, it has been proposed to inspissate the wort into a rob, or thin extract like a syrup; afterwards to thin it with water, and ferment it in the usual manner. This certainly promises great success; there is no subject we know of that is possessed of any kind of essential oil, but what will part with it by distillation or by long boiling. The inspissating of the wort, however, does not seem to be either necessary or safe to be attempted; for, in this case, there is great danger of its contracting an empyreuma, which never could be remedied. The quantity lost by evaporation, therefore, might be occasionally added, with an equal certainty of dissipating the obnoxious oil. Whether the yield of spirit would be as great in this case as in the other, is a question that can by no means be discussed without further experiments. According to a theory adopted by some distillers, namely, that essential oils are convertible into ardent spirits; and that the more oily any subject is, the greater quantity of spirit is obtainable from it; the practice of dissipating the oil before fermentation must certainly be a loss. But we are too little acquainted with the composition of vinous spirits, to have any just foundation for adopting such theories. Besides, it is certain, that the quantity of ardent spirit producible from any substance, malt for instance, very greatly exceeds the quantity of essential oil which can by any means be obtained from the same; nor do we find that those substances, which abound most in essential oil, yield the greatest quantity of spirits. So far from this, fine sugar, which contains little or no essential oil, yields a great deal of ardent spirit.

4
Directions concerning fermentation.

Previous to the operation of distilling, those of brewing and fermentation are necessary: but as these are fully treated of under the article *BREWING*, we shall here only observe, that unless the boiling of the wort, before fermentation, is found to dissipate the essential oil, so as to take away the flavour of the malt, there is no necessity for being at the trouble of that operation. The wort may be immediately cooled and fermented.—The fermentation ought always to be carried on as slowly as possible, and performed in vessels closely stoppered; only having at the bung a valve pressed down by a spring, which will yield with less force than is suffi-

cient to burst the vessel. It should even be suffered to remain till it has become perfectly fine and transparent; as by this means the spirit will not only be superior in quantity, but also in fragrance, pungency, and vinosity, to that commonly produced.

Distillation

With regard to performing the operation of distilling, there is only one general rule that can be given, namely, to let the heat, in all cases, be as gentle as possible. Accidents will be effectually prevented by having the worm of a proper wideness, and by rectifying the spirits in a water-bath; which, if sufficiently large, will perform the operation with all the dispatch requisite for the most extensive business.—The vessel in which the rectification is performed, ought to be covered with water up to the neck, and to be loaded with lead at the bottom; so that it may sink in the water. Thus the operation will go on as quickly as if it was an open fire, and without the least danger of a miscarriage; nor will it ever be necessary to make the water in the bath come to a boiling heat.

For 5 distillation.

As the end of rectification is to make the spirit *clean* for rectification, as well as *strong*, or to deprive it of the essential oil as scum.

as well as the aqueous part, it will be proper to have regard to this even in the first distillation. For this purpose, the spirit, as it first comes over, should be received into a quantity of cold water; as by this means the connection betwixt it and the oily matter will be considerably lessened. For the same reason, after it has been once rectified in the water-bath, it should be again mixed with an equal quantity of water, and distilled a second time. Thus the spirit will be freed from most of the oily matter, even though it hath been very much impregnated with it at first. It is necessary to observe, however, that by using such a quantity of water, a considerable part of the water will be left in the residuum of each rectification. All these residuums, therefore, must be mixed together, and distilled on an open fire, with a brisk heat, that the remainder of the spirit may be got out.

After the spirit has been distilled once or twice in this manner from water, it may be distilled in a water-bath without any addition; and this last rectification will free it from most of the water it contains. But if it is required to be highly dephlegmated, a quantity of pure and dry salt of tartar must be added. The attraction betwixt this salt and water is greater than that betwixt water and spirit of wine. The salt therefore imbibes the water contained in the spirit, and sinks with it to the bottom. The spirit, by a single distillation, may then be rendered perfectly free from water; but there is great danger of some of the alkaline salt rising along with it, and impregnating it with what is called an *urinous flavour*. When this once happens, it is impossible to be remedied; and the only way to prevent it is, to make the heat with which the spirit is distilled as gentle as possible. It hath been proposed, indeed, to prevent the rising of any thing alkaline, by the admixture of some calcined vitriol, sal catharticus amarus, or other imperfect neutral salt; but this can scarce be supposed to answer any good purpose, as the alkali unites itself with the oily matter of the spirit, and forms a kind of saponaceous compound, which is not so easily affected by the acid of the vitriol or other salt, especially as these salts will not dissolve in the spirit itself.

Distillation.

One very great desideratum among the distillers of this country is, a method of imitating the foreign spirits, brandy, rum, gin, &c. to a tolerable degree of perfection; and notwithstanding the many attempts that are daily made for this purpose, the success in general hath been but very indifferent. On this subject, Mr Cooper hath the following observations, in his Complete System of Distillation; which, as they are applicable to all other spirits as well as brandy, we shall here transcribe.—“The general method of distilling brandies in France need not be formally described, as it differs in nothing from that practised here in working from malt-wash or molasses; nor are they in the least more cleanly or exact in the operation. They only observe more particularly to throw in a little of the natural ley into the still along with the wine, as finding this gives their spirit the flavour for which it is generally admired abroad.—But, though brandy is extracted from wine, experience tells us that there is a great difference in the grapes from which the wine is made. Every soil, every climate, every kind of grapes, varies with regard to the quantity and quality of the spirits extracted from them. There are some grapes which are only fit for eating; others for drying, as those of Damacus, Corinth, Provence, and Avignon, but not fit to make wine.—Some wines are very proper for distillation, and others much less so. The wines of Languedoc and Provence afford a great deal of brandy by distillation, when the operation is performed on them in their full strength. The Orleans wines, and those of Blois, afford yet more: but the best are those of the territories of Cogniac and Andaye; which are, however, in the number of those the least drunk in France. Whereas those of Burgundy and Champagne, though of a very fine flavour, are improper, because they yield but very little in distillation.

Method of making brandies in France.

“It must also be farther observed, that all the wines for distillation, as those of Spain, the Canaries, of Alicant, of Cyprus, of St Peres, of Toquet, of Grave, of Hungary, and others of the same kind, yield very little brandy by distillation; and consequently would cost the distiller considerably more than he could sell it for. What is drawn from them is indeed very good, always retaining the saccharine quality and rich flavour of the wine from whence it is drawn; but as it grows old, this flavour often becomes aromatic, and is not agreeable to all palates.

“Hence we see that brandies always differ according as they are extracted from different species of grapes. Nor would there be so great a similarity as there is between the different kinds of French brandies, were the strongest wines used for this purpose; but this is rarely the case; the weakest and lowest flavoured wines only are distilled for their spirit, or such as prove absolutely unfit for any other use.

“A large quantity of brandy is distilled in France during the time of the vintage; for all those poor grapes that prove unfit for wine, are usually first gathered, pressed, their juice fermented, and directly distilled. This rids their hands of their poor wines at once, and leaves their casks empty for the reception of better. It is a general rule with them not to distil wine that will fetch any price as wine; for, in this state, the profits upon them are vastly greater than when re-

duced to brandies. This large stock of small wines, with which they are almost over-run in France, sufficiently accounts for their making such vast quantities of brandy in that country, more than in others which lie in warmer climates and are much better adapted to the production of grapes.—Nor is this the only fund of their brandies: for all the wine that turns eager, is also condemned to the still; and, in short, all that they can neither export nor consume at home, which amounts to a large quantity; since much of the wine laid in for their family provision is so poor as not to keep during the time of spending.

“Hence many of our English spirits, with proper management, are convertible into brandies that shall hardly be distinguished from the foreign in many respects, provided the operation be neatly performed.

“The common method of rectifying spirits from alkaline salts, destroys their vinosity, and in its stead introduces an urinous or lixivious taste. But as it is absolutely necessary to rectify, or at least to substitute in its room, some degree of vinosity, several methods have been proposed, and a multitude of experiments performed, in order to discover this great desideratum. But none has succeeded equal to the spirit of nitre; and accordingly this spirit, either strong or dulcified, has been used by most distillers to give an agreeable vinosity to their spirits. Several difficulties, however, occur in the method of using it; the principal of which is, its being apt to quit the liquor in a short time, and consequently depriving the liquor of that vinosity it was intended to give. In order to remove this difficulty, and prevent the vinosity from quitting the goods, the dulcified spirit of nitre, which is much better than the strong spirit, should be prepared by a previous digestion, continued for some time, with alcohol; the longer the digestion is continued, the more intimately will they be blended, and the compound rendered the milder and softer.

After a proper digestion, the dulcified spirit should be mixed with the brandy, by which the vinosity will be intimately blended with the goods, and not disposed to fly off for a very considerable time.—No general rule can be given for the quantity of this mineral acid requisite to be employed; because different proportions of it are necessary in different spirits. It should, however, be carefully attended to, that though a small quantity of it will undoubtedly give an agreeable vinosity resembling that naturally found in the fine subtle spirits drawn from wines, yet an over large dose of it will not only cause a disagreeable flavour, but also render the whole design abortive, by discovering the imposition. Those, therefore, who endeavour to cover a foul taste in goods by large doses of dulcified spirit of nitre, will find themselves deceived.

“But the best, and indeed the only method of imitating French brandies to perfection, is by an essential oil of wine; this being the very thing that gives the French brandies their flavour. It must, however, be remembered, that, in order to use even this ingredient to advantage, a pure tasteless spirit must first be procured; for it is ridiculous to expect that this essential oil should be able to give the agreeable flavour of French brandies to our fulsome malt spirit, already loaded with its own nauseous oil, or strongly impregnated with a lixivious taste from the alkaline salts used

Distillation in rectification. How a pure insipid spirit may be obtained, has already been considered; it only therefore remains to show the method of procuring this essential oil of wine, which is this:

“Take some casks of dry wine-lees, such as are used by our hatters, dissolve them in six or eight times their weight of water, dilute the liquor with a slow fire, and separate the oil with a separating glass; reserving for the nicest uses only that which comes over first, the succeeding oil being coarser and more resinous.—Having procured this fine oil of wine, it may be mixed into a quintessence with pure alcohol; by which means it may be preserved a long time fully possessed of all its flavour and virtues; but, without such management, it will soon grow resinous and rancid.

“When a fine essential oil of wine is thus procured, and also a pure and insipid spirit, French brandies may be imitated to perfection, with regard to the flavour. It must, however, be remembered, and carefully adverted to, that the essential oil be drawn from the same kind of lees as the brandy to be imitated was procured from; we mean, in order to imitate Coniac brandy, it will be necessary to distil the essential oil from Coniac lees; and the same for any other kind of brandy. For, as different brandies have different flavours, and as these flavours are entirely owing to the essential oil of the grape, it would be preposterous to endeavour to imitate the flavour of Coniac brandy with an essential oil procured from the lees of Bourdeaux wine.—When the flavour of the brandy is well imitated by a proper dose of the essential oil, and the whole reduced into one simple and homogeneous fluid, other difficulties are still behind: The flavour, though the essential part, is not, however, the only one; the colour, the proof, and the softness, must also be regarded, before a spirit that perfectly resembles brandy can be procured. With regard to the proof, it may be easily lit, by using a spirit rectified above proof; which, after being intimately mixed with the essential oil of wine, may be let down to a proper standard with fair water. And the softness may, in a great measure, be obtained by distilling and rectifying the spirit with a gentle fire; and what is wanting of this criterion in the liquor when first made, will be supplied by time: for it must be remembered, that it is time alone that gives this property to French brandies; they being at first acrid, foul, and fiery. But, with regard to the colour, a particular method is required to imitate it to perfection.

TO
Spirits how
coloured.

“The art of colouring spirits owes its rise to observations on foreign brandies. A piece of French brandy that has acquired by age a great degree of softness and ripeness, is observed at the same time to have acquired a yellowish brown colour; and hence our distillers have endeavoured to imitate this colour in such spirits as are intended to pass for French brandy. And in order to this, a great variety of experiments have been made on different substances. But in order to know a direct and sure method of imitating this colour to perfection, it is necessary we should be informed whence the French brandies themselves acquire their colour. This discovery is very easily made. The common experiment of trying whether brandy will turn blackish with a solution of iron, shows that the colour is owing to some of the resinous matter of the oak-cask dissolved in the spirit. There can be no difficulty, therefore, in

imitating this colour to perfection. A small quantity of the extract of oak, or the shavings of that wood, properly digested, will furnish us with a tincture capable of giving the spirit any degree of colour required. But it must be remembered, that as the tincture is extracted from the cask by brandy, that is, alcohol and water, it is necessary to use both in extracting the tincture; for each of these dissolves different parts of the wood. Let, therefore, a sufficient quantity of oak shavings be digested in strong spirit of wine, and also at the same time other oak-shavings be digested in water; and when the liquors have acquired a strong tincture from the oak, let both be poured off from the shavings into different vessels, and both placed over a gentle fire till reduced to the consistence of treacle. In this condition let the two extracts be intimately mixed together; which may be effectually done by adding a small quantity of loaf-sugar, in fine powder, and rubbing the whole well together. By this means a liquid essential extract of oak will be procured, and always ready to be used as occasion shall require.

“There are other methods in use for colouring brandies; but the best, besides the extract of oak above mentioned, are treacle and burnt sugar. The treacle gives the spirit a fine colour, nearly resembling that of French brandy; but as its colour is dilute, a large quantity must be used: this is not, however, attended with any bad consequences; for notwithstanding the spirit is really weakened by this addition, yet the bubble proof, the general criterion of spirits, is greatly mended by the tenacity imparted to the liquor by the treacle. The spirit also acquires from the mixture a sweetish or luscious taste, and a fullness in the mouth; both which properties render it very agreeable to the palates of the common people, who are in fact the principal consumers of these spirits. A much smaller quantity of burnt sugar than of treacle will be sufficient for colouring the same quantity of spirits: the taste is also very different; for instead of the sweetness imparted by the treacle, the spirit acquires from the burnt sugar an agreeable bitterness, and by that means recommends itself to nicer palates, which are offended with a luscious spirit. The burnt sugar is prepared by dissolving a proper quantity of sugar in a little water, and scorching it over the fire till it acquires a black colour. Either treacle or burnt sugar will nearly imitate the genuine colour of old French brandy; but neither of them will succeed when put to the test of the vitriolic solution.

“The spirit distilled from molasses or treacle is very clean or pure. It is made from common treacle dissolved in water, and fermented in the same manner as the wash for the common malt spirit. But if some particular art is not used in distilling this spirit, it will not prove so vinous as malt spirit, but more flat and less pungent and acid, though otherwise much cleaner tasted, as its essential oil is of a much less offensive flavour. Therefore, if good fresh wine lees, abounding in tartar, be added and duly fermented with the molasses, the spirit will acquire a much greater vivacity and briskness, and approach much nearer to the nature of foreign spirits. Where the molasses spirit is brought to the common proof-strength, if it is found not to have a sufficient vivacity, it will be very proper to add some good dulcified spirit of nitre; and if the spirit be clean

Distillation

¹¹ Distillati a. worked, it may, by this addition only, be made to pass on ordinary judges for French brandy. Great quantities of this spirit are used in adulterating foreign brandy, rum, and arrack. Much of it is also used alone in making cherry-brandy and other drinks by infusion; in all which many, and perhaps with justice, prefer it to foreign brandies. Molasses, like all other spirits, is entirely colourless when first extracted; but distillers always give it as nearly as possible the colour of foreign spirits."

¹¹ Rum how imitated.

If these principles hold good, the imitation of foreign spirits of all kinds must be an easy matter. It will only cost the procuring of some of those substances from which the spirit is drawn; and distilling this with water, the essential oil will always give the flavour desired. Thus, to imitate Jamaica rum, it will only be necessary to procure some of the tops, or other useless parts, of the sugar-canes; from which an essential oil being drawn, and mixed with clean molasses spirit, will give it the true flavour. The principal difficulty must lie in procuring a spirit totally, or nearly, free of all flavour of its own. The spirit drawn from the refuse of a sugar-house is by our author commended as superior to that drawn from molasses: though even this is not entirely devoid of some kind of flavour of its own; nor indeed is that drawn from the best refined sugar entirely flavourless. It is very probable, therefore, that to procure an absolutely flavourless spirit is impossible. The only method, therefore, of imitating foreign spirits is, by choosing such materials as will yield a spirit flavoured as much like them as possible. The materials most recommended by our author in this case, and probably the best that can be used, are raisins. Concerning these he gives the following directions: "In order to extract this spirit, the raisins must be infused in a proper quantity of water, and fermented in the manner already directed. When the fermentation is completed, the whole is to be thrown into the still, and the spirit extracted by a strong fire. The reason why we here direct a strong fire, is because by that means a greater quantity of the essential oil will come over the helm with the spirit, which will render it fitter for the distiller's purpose: for this spirit is commonly used to mix with common malt goods: and it is surprising how far it will go in this respect, ten gallons of it being often sufficient to give a determining flavour and agreeable vinosity to a whole piece of malt spirits. It is therefore well worth the distiller's while to endeavour at improving the common method of extracting spirits from raisins; and perhaps the following hint may merit attention. When the fermentation is completed, and the still charged with fermented liquor as above directed, let the whole be drawn off with as brisk a fire as possible; but, instead of the cask or can generally used by distillers for a receiver, let a large glass, called by chemists a *separating glass*, be placed under the nose of the worm, and a common receiver applied to the spout of the separating glass: by this means the essential oil will swim upon the top of the spirit, or rather low wine, in the separating glass, and may be easily preserved at the end of the operation. The use of this limpid essential oil is well known to distillers; for in this resides the whole flavour, and consequently may be used to the greatest advantage in giving that distinguishing taste and true vinosity to the

¹² Raisins the best material for procuring pure spirit.

common malt spirits. After the oil is separated from the low-wine, the liquor may be rectified in balneo marie into a pure and almost tasteless spirit, and therefore well adapted to make the finest compound cordials, or to imitate or mix with the finest French brandies, arracks, &c. In the same manner a spirit may be obtained from cyder. But as its particular flavour is not so desirable as that obtained from raisins, it should be distilled in a more gentle manner, and carefully rectified according to the directions we have already given."

These directions may suffice for the distillation of any kind of simple spirits. The distillation of compound ones depends on the observation of the following general rules, which are very easy to be learned and practised.

1. The artist must always be careful to use a well cleansed spirit, or one freed from its own essential oil. For, as a compound water is nothing more than a spirit impregnated with the essential oil of the ingredients, it is necessary that the spirit should have deposited its own.

2. Let the time of previous digestion be proportioned to the tenacity of the ingredients, or the ponderosity of their oil.

3. Let the strength of the fire also be proportioned to the ponderosity of the oil intended to be raised with the spirit.

4. Let only a due proportion of the finest parts of the essential oil be united with the spirit; the grosser and less fragrant parts of the oil not giving the spirit so agreeable a flavour, and at the same time rendering it unwholesome. This may in a great measure be effected by leaving out the faints, and making up to proof with fine soft water in their stead.

A careful observation of these four rules will render this part of distillation much more perfect than it is at present. Nor will there be any occasion for the use of burnt alum, white of eggs, iisinglass, &c. to fine down cordial waters; for they will presently be fine, sweet and pleasant tasted, without any further trouble. We shall now subjoin particular receipts for making some of those compound waters, or spirits, that are most commonly to be met with, and are in the most general estimation.

¹⁴ Receipts for compound spirits.
Strong Cinnamon-water. Take eight pounds of fine cinnamon bruised, 17 gallons of clean rectified spirit, and two gallons of water. Put them into your still, and digest them 24 hours with a gentle heat; after which draw off 16 gallons with a pretty strong heat.—A cheaper spirit, but of an inferior quality, may be obtained by using cassia lignea instead of cinnamon. If you would dulcify your cinnamon water, take double-refined sugar in what quantity you please; the general proportion is about two pounds to a gallon; and dissolve it in the spirit, after you have made it up proof with clean water. One general caution is here necessary to be added; namely, that near the end of the operation, you carefully watch the spirit as it runs into the receiver, in order to prevent the faints from mixing with the goods. This you may discover by often catching some of it as it runs from the worm in a glass, and observing whether it is fine and transparent; for as soon as ever the faints begin to rise, the spirit will have an azure or bluish cast. As soon as this alteration

Distillation. tion in colour is perceived, the receiver must be immediately changed; for if the faints are suffered to mix themselves with the rest, the value of the goods will be greatly lessened.—Here we may observe, that the distillers call such goods as are made up proof, *double goods*; and those below proof, *single*.

Clrove-water. Take of cloves bruised, four pounds; pimento, or all-spice, half a pound; proof-spirit, 16 gallons. Digest the mixture 12 hours in a gentle heat, and then draw off 15 gallons with a pretty brisk fire. The water may be coloured red, either by a strong tincture of cochineal, alkanet, or corn-poppay flowers. It may be dulcified at pleasure with double refined sugar.

Lemon-water. Take of dried lemon-peel, four pounds; clean proof spirit 10 gallons and a half, and one gallon of water. Draw off 10 gallons by a gentle fire, and dulcify with fine sugar.

Citron-water. Take of dry yellow rinds of citrons, three pounds; of orange-pel, two pounds; nutmegs bruised, three quarters of a pound; clean proof-spirit, ten gallons and a half; water, one gallon: digest with a gentle heat; then draw off ten gallons in balneo marie, and dulcify with fine sugar.

Aniseed-water. Take of aniseed bruised, two pounds; proof-spirit, 12 gallons and a half; water, one gallon: draw off ten gallons with a moderate fire.—This water should never be reduced below proof; because the large quantity of oil with which it is impregnated, will render the goods milky and foul when brought down below proof. But if there is a necessity for doing this, their transparency may be restored by filtration.

Orange-water. Take of the yellow part of fresh orange-peel, five pounds; clean proof-spirit, ten gallons and a half; water, two gallons: draw off ten gallons with a gentle fire.

Cedrat-water. The cedrat is a species of citron, and very highly esteemed in Italy where it grows naturally. The fruit is difficult to be procured in this country; but as the essential oil is often imported from Italy, it may be made with it according to the following receipt.—Take of the finest loaf-sugar reduced to powder, a quarter of a pound; put it into a glass mortar, with 120 drops of the essence of cedrat; rub them together with a glass pottle; and put them into a glass alembic, with a gallon of fine proof-spirits and a quart of water. Place the alembic in balneo marie, and draw off one gallon, or till the faints begin to rise; and dulcify with fine sugar. This is reckoned the finest cordial yet known; it will therefore be necessary to be particularly careful that the spirit is perfectly clean, and, as much as possible, freed from any flavour of its own.

Orange Cordial-water, or Eau de Bigarade. Take the outer or yellow part of the peels of 14 bigarades, (a kind of oranges); half an ounce of nutmegs, a quarter of an ounce of mace, a gallon of fine proof-spirit, and two quarts of water. Digest all these together two days in a close vessel; after which draw off a gallon with a gentle fire, and dulcify with fine sugar. This cordial is greatly esteemed abroad, but is not so well known in this country.

Ros Solis. Take of the herb called *Ros Solis*, picked

clean, four pounds; cinnamon, cloves, and nutmegs, *Distillation.* of each three ounces and a half; marigold flowers, one pound; caraway seeds, ten ounces; proof-spirit, ten gallons; water, three gallons. Distill with a pretty strong fire, till the faints begin to rise. Then take of liquorice-root sliced, half a pound; raisins stoned, two pounds; red saunders, half a pound: digest these three days in two quarts of water; then strain out the clear liquor, in which dissolve three pounds of fine sugar, and mix it with the spirit drawn by distillation.

Ufquebaugh. Take nutmegs, cloves, and cinnamon, of each two ounces; the seeds of anise, caraway, and coriander, of each four ounces; of liquorice-root sliced, half a pound. Bruise the seeds and spices; and put them, together with the liquorice, into the still with 11 gallons of proof-spirits, and two gallons of water. Distill with a pretty brisk fire till the faints begin to rise. But, as soon as the still begins to work, fasten to the nose of the worm two ounces of English saffron tied up in a cloth, that the liquor may run thro' it, and extract all its tincture; and in order to this, you should frequently press the saffron with your fingers. When the operation is finished, dulcify your goods with fine sugar.

Ratafia. Is a liquor prepared from different kinds of fruits, and is of different colours according to the fruits made use of. Of red ratafia there are three kinds, the fine, the dry or sharp, and the common. The fruits most proper for making red ratafia, are the black heart-cherry, the common red cherry, the black cherry, the merry or honey cherry, the strawberry, the raspberry, the red gooseberry, and the mulberry. These fruits should be gathered when in their greatest perfection, and the largest and most beautiful of them chosen for the purpose.—The following is a receipt for making red ratafia, fine and soft. Take of the black heart-cherries 24 pounds; black cherries, four pounds; raspberries and strawberries, of each three pounds. Pick the fruits from their stalks, and bruise them; in which state let them continue 12 hours: press out the juice; and to every pint of it add a quarter of a pound of sugar. When the sugar is dissolved, run the whole through the filtering bag, and add to it three quarts of clean proof-spirits. Then take of cinnamon, four ounces; of mace, one ounce; and of cloves, two drams. Bruise these spices; put them into an alembic with a gallon of clean proof-spirits and two quarts of water, and draw off a gallon with a brisk fire. Add as much of this spicy spirit to your ratafia as will render it agreeable to your palate; about one fourth is the usual proportion.

Ratafia made according to the above receipt will be of a very rich flavour and elegant colour. It may be rendered more or less of a spicy flavour, by adding or diminishing the quantity of spirit distilled from the spices.—Some, in making ratafia, suffer the expressed juices of their fruits to ferment several days: by this means the vinosity of the ratafia is increased; but, at the same time, the elegant flavour of the fruits is greatly diminished. Therefore, if the ratafia is desired stronger or more vinous, it may be done by adding more spirits to the expressed juice; by which means the flavour of the fruits may be preserved, as well as the ratafia rendered stronger. It is also a method with some to tie the spices in a linen bag, and suspend them in the ratafia.

Distillation. *rafia.* But if this method is taken, it will be necessary to augment the quantity of spirit first added to the expressed juice. There is no great difference in the two methods of adding the spices, except that by suspending them in the rafia the liquor is rendered less transparent.

Dry or sharp Rafia. Take cherries and gooseberries, of each 30 pounds; mulberries, seven pounds; raspberries, ten pounds. Pick all these fruits clean from their stalks, &c. bruise them, and let them stand 12 hours; but do not suffer them to ferment. Press out the juice, and to every pint add three ounces of sugar. When the sugar is dissolved, run it through the filtering bag, and to every five pints of liquor add four pints of clean proof-spirit; together with the same proportion of spirit drawn from the spices in the foregoing composition.

Common Rafia. Take of nutmegs, eight ounces; bitter almonds, ten pounds; Lisbon sugar, eight pounds; ambergrease, ten grains: infuse these ingredients three days in ten gallons of clean proof-spirit, and filter thro' a flannel bag for use. The nutmegs and bitter almonds must be bruised, and the ambergrease rubbed with the Lisbon sugar in a marble mortar, before they are infused in the spirit.

Gold Cordial. Take of the roots of angelica, four pounds; raisins stoned, two pounds; conander seeds, half a pound; caraway-seeds and cinnamon, of each half a pound; cloves, two ounces; figs and liquorice-root, of each one pound; proof-spirit, eleven gallons; water, two gallons. The angelica, liquorice, and figs, must be sliced before they are added. Digest two days; and draw off by a gentle heat till the fairs begin to rise; hanging in a piece of linen, fastened to the mouth of the worm; an ounce of English saffron. Then dissolve eight pounds of sugar in three quarts of rose-water, and add to it the distilled liquor.—This liquor derives its name of *Gold Cordial*, from a quantity of leaf-gold being formerly added to it; but this is now generally disused, as it cannot possibly add any virtue.

Cardamum, or All-four. Take of pimento, caraway, and coriander seeds, and lemon-peel, each three pounds; of malt spirits, eleven gallons; water, three gallons. Draw off with a gentle fire, dulcify with common sugar, and make up to the strength desired with clear water.—This is a dram greatly used by the poorer sort of people in some countries.

Geneva. There was formerly sold in the apothecaries shops a distilled spirituous water of juniper; but the vulgar being fond of it as a dram, the distillers supplanted the apothecaries, and sold it under the name of *Geneva*. The common kind, however, is not made from juniper-berries, but from oil of turpentine; and indeed it is surprising, that people should accustom themselves to drink such liquors for pleasure.—The receipt for making this kind of spirit, sold in the gin-shops at London, is as follows. Take of the ordinary malt spirits, ten gallons; oil of turpentine, two ounces; bay-salt, three handfuls. Draw off by a gentle fire till the fairs begin to rise; and make up your goods to the strength required with clear water.

The best kind is made by the following recipe.—Take of juniper-berries, three pounds; proof-spirit, ten gallons; water, four gallons: Draw off by a gentle

fire till the fairs begin to rise, and make up your goods to the strength required with clean water.

There is a sort of this liquor called *Hollands Geneva*, from its being imported from Holland, which is greatly esteemed.—The ingredients used by the Dutch are the same with those given in the last recipe; only, instead of malt-spirits, they use French brandy. But from what has been already observed concerning the nature of these kind of spirits, it is easy to see, that by the help of a well rectified spirit, geneva may be made in this country at least nearly equal to the Dutch, provided it is kept to a proper age; for all spirituous liquors contract a softness and mellowness by age, impossible to be imitated any other way.

DISTILLERY, the art of distilling brandy and other spirits. This art was first brought into Europe by the Moors of Spain, about the year 1150: they learned it of the African Moors, who had it from the Egyptians: and the Egyptians are said to have practised it in the reign of the emperor Dioclesian, though it was unknown to the ancient Greeks and Romans. See **DISTILLATION**, and **FERMENTATION**.

DISTINCTION, in logic, is an assemblage of two or more words, whereby disparate things, or their conceptions, are denoted.

DISTORTION, in medicine, is when any part of the human body remarkably deviates from its natural shape or position. Distortions of different parts may arise either from a convulsion or palsy; though sometimes a terrible distortion in the shape of the whole body hath arisen merely from carelessness and ill habits. Mr Winslow, in the Memoirs of the Academy of Sciences at Paris, gives a very remarkable account of a lady of quality, whom he had known to be perfectly straight for several years; but who taking afterwards to a sedentary course of life, got a custom of dressing herself very carelessly, and of leaning as she sat, either forwards or to a side. It was not many months before she found it painful and troublesome to stand or sit upright; and soon afterwards she found an inequality in the lower part of the back-bone. Alarmed at this, she consulted the gentleman who gave the account. To prevent the increase of the malady, he ordered her to wear a particular sort of jumps instead of stays, and had a pad of a proper size applied: but this was soon neglected; and the consequence was, that in a little time the back-bone became more and more crooked, and at length bent itself sidewise in two contrary directions, so as to represent the figure of the Roman S; and the lady, still refusing to take the proper measures, lost a fourth part of her height; and continued for the remainder of her life, not only crooked from right to left and from left to right, but so oddly folded together, that the first of the false ribs on one side approached very near the crest of the os ilium on that side, and the viscera of the lower belly became strangely pushed out of their regular places to the opposite side; and the stomach itself was so strongly compressed, that whatever the swallowed seemed to her to fall into two separate cavities.

DISTRESS, in its ordinary acceptation, denotes calamity, misery, or painful suffering.

The Contemplation of Distress, a source of pleasure. On this subject we have a very pleasing and ingenious essay by Dr Barnes, in the Memoirs of the Literary and

Distillery
Distress.

Diffress. and Philosophical Society of Manchester *. It is introduced with the following motto :

* Vol. I.
p. 144, &c.

*Suave mori magno, turbantibus aequa ventis,
E terrâ ulterius magnam spectare periclium.
Non quia vocari quinquam est vivanda voluptas;
Sed quibus ipse malis careat, quia cernere suave est.*

LUCRETIVS.

"The pleasure here described by the poet, and of which he has mentioned so striking and apposite an instance, may perhaps at first seem of so singular and astonishing a nature, that some may be disposed to doubt of its existence. But that it does exist, in the case here referred to, and in many others of a similar kind, is an undoubted fact; and it may not appear an useless or disagreeable entertainment, to trace its source in the human breast, together with the final cause for which it was implanted there by our benevolent Creator.

"Shall I, it may be said, feel complacency in beholding a scene in which many of my fellow-creatures are agonizing with terror, whilst I can neither diminish their danger, nor, by my sympathy, divide their anguish? At the sight of another's woe, does not my bosom naturally feel pain? Do I not share in his sensations? And is not this strong and exquisite sensibility intimated by my Maker to urge me on to active and immediate assistance? These sensations are indeed attended with a noble pleasure, when I can, by friendly attention, or by benevolent communication, soothe the sorrows of the poor mourner, snatch him from impending danger, or supply his pressing wants. But in general, where my sympathy is of no avail to the wretched sufferer, I fly from the spectacle of his misery, unable or unwilling to endure a pain which is not allayed by the sweet satisfaction of doing good."

It will be necessary, in answer to these objections, in the first place to prove the reality of the feeling, the cause of which, in the human constitution, we here attempt to explore.

Mr Addison, in his beautiful papers on the Pleasures of the Imagination, has observed, "that objects or scenes, which, when real, give disgust or pain, in description often become beautiful and agreeable. Thus, even a dunghill may, by the charms of poetic imagery, excite pleasure and entertainment. Scenes of this nature, dignified by apt and striking description, we regard with something of the same feelings with which we look upon a dead monster.

Informe colorare

*Prohibetur: nequeunt expleri corda tuenda
Terribiles oculos, cultum, villi, sanguis letis
Peciora semiferi, atque extinctos fœdibus ignes.*

VIRGIL.

"This (he observes) is more particularly the case, where the description raises a ferment in the mind and works with violence upon the passions. One would wonder (adds he) how it comes to pass, that passions, which are very unpleasant at all other times, are very agreeable when excited by proper description; such as terror, dejection, grief, &c. This pleasure arises from the reflection we make upon ourselves, whilst reading it, that we are not in danger from them. When we read of wounds, death, &c. our pleasure does not rise so properly from the grief which these melancholy descriptions give us, as from the secret comparison we make of ourselves with those who suffer. We should

Diffress. not feel the same kind of pleasure, if we actually saw a person lying under the tortures that we meet with in a description."

And yet, upon the principle assigned by this amiable writer, we might feel the same, or even higher pleasure, from the actual view of distress, than from any description; because the comparison of ourselves with the sufferer would be more vivid, and consequently the feeling more intense. We would only observe, that the cause which he assigns for this pleasure is the very same with that assigned by Lucretius in our motto. Mr Addison applies it to the description; the poet, to the actual contemplation of affecting scenes. In both the pleasure is supposed to originate in selfishness. But wherever the social passions are deeply interested, as they are here supposed to be, from the pathetic description, or the still more pathetic survey, of the sufferings of another, the sympathetic feelings will of themselves, at once, and previously to all reflection, become a source of agreeable and tender emotions. They will thus dignify and enhance the satisfaction, if any such be felt, arising merely from the consideration of our own personal security. And the more entirely we enter into the scene, by losing all ideas of its being either past or fabulous, the more perfectly we forget ourselves, and are absorbed in the feeling,—the more exquisite is the sensation.

But as our subsequent speculations will chiefly turn upon the pleasure derived from real scenes of calamity, and not from those which are imaginary, it may be expected that we produce instances in proof that such pleasure is felt by persons very different in their taste and mental cultivation.

We shall not mention the horrid joy with which the savage feasts his eye upon the agonies and contortions of his expiring prisoner—expiring in all the pains which artificial cruelty can inflict! Nor will we recur to the almost equally savage sons of ancient Rome, when the majesty of the Roman people could rush, with eagerness and transport, to behold hundreds of gladiators contending in fatal conflict, and probably more than half the number extended, weltering in blood and writhing in agony, upon the plain. Nor will we mention the Spanish bull-feasts; nor the fervent acclamations of an English mob around their fellow-creatures, when engaged in furious battle, in which it is possible that some of the combatants may receive a mortal blow, and be hurried in this awful state to the bar of his Judge. Let us survey the multitudes which, in every part of the kingdom, always attend an execution. It may perhaps be said, that in all places the vulgar have little of the sensibility and tenderness of more polished bosoms. But, in the last mentioned instance, an execution, there is no exultation in the sufferings of the poor criminal. He is regarded by every eye with the most melting compassion. The whole assembly sympathizes with him in his unhappy situation. An awful stillness prevails at the dreadful moment. Many are wrung with unutterable sensations; and prayer and silence declare, more loudly than any language could, the interest they feel in his distress. Should a reprieve come to rescue him from death, how great is the general triumph and congratulation! And probably in this multitude you will find not the mere vulgar herd alone, but the man of superior knowledge and of more refined sensibility;

Distracts

sensibility; who, led by some strong principle, which we wish to explain, feels a pleasure greater than all the pain, great and exquisite as one should imagine it to be, from such a spectacle.

The man who condemns many of the scenes we have already mentioned as barbarous and shocking, would probably run with the greatest eagerness to some high cliff, overhanging the ocean, to see it swelled into a tempest, though a poor vessel, or even a fleet of vessels, were to appear as one part of the dreadful scenery, now lifted to the heavens on the foaming surge, now plunged deep into the fathomless abyss, and now dashed upon the rocks, where they are in a moment shivered into fragments, and, with all their mariners, entombed in the wave. Or, to vary the question a little; Who would not be forward to stand fast, on the top of some mountain or tower, adjoining to a field of battle, in which two armies meet in desperate conflict, though probably thousands may soon lie before him prostrate on the ground, and the whole field present the most horrid scenes of carnage and desolation?

That in all these cases pleasure predominates in the compounded feeling, is plain from hence, because you continue to survey the scene; whereas when pain became the stronger sensation, you would certainly retire.

Cultivation may indeed have produced some minuter differences in the taste and feelings of different minds. Those whose sensibilities have not been refined by education or science, may feel the pleasure in a more gross and brutal form. But do not the most polished nature feel a similar, a kindred pleasure, in the deep-wrought distresses of the well-imagined scene? Here the endeavour is, to introduce whatever is dreadful or pathetic, whatever can harrow up the feelings or extort the tear. And the deeper and more tragical the scene becomes, the more it agitates the several passions of terror, grief, or pity—the more intensely it delights, even the most polished minds. They seem to enjoy the various and vivid emotions of contending passions. They love to have the tear trembling in the eye, and to feel the whole soul wrapt in thrilling sensations. For that moment they seem to forget the fiction; and afterwards commend that exhibition most, in which they most entirely lost sight of the author, and of their own situation, and were alive to all the unutterable vibrations of fear or melting sensibility.

Taking it then for granted, that in the contemplation of many scenes of distress, both imaginary and real, a gratification is felt, let us endeavour to account for it, by mentioning some of those principles, woven into the web of human nature, by its benevolent Creator, on which that gratification depends.

Dr Akenfide, with his accustomed strength and brilliancy of colouring, describes and accounts for it in the following manner.

—“ Behold the ways
Of heaven's eternal design to man!
For ever just, benevolent, and wise!
That Virtue's awful steps, how'er pursued
By vexing fortune, and intrusive pain,
Should never be divided from her chaste,
Her fair attendant, Pleasure. Need I urge
Thy tardy thought, through all the various round
Of this existence, that thy softening soul
At length may learn, what energy the hand
Of Virtue mingles in the bitter tide

Distracts

Of Passion, swelling with distress and pain,
To mitigate the sharp, with gracious drops
Of cordial Pleasure. Ask the faithful youth,
Why the cold urn of her, whom long he loved,
So often fills his arm? So often draws
His lonely foresteps, at the silent hour,
To pay the mournful tribute of his tears?
O! he will tell thee, that the wealth of worlds
Should ne'er seduce his beam to forego
That sacred hour, when healing from the noise
Of care and envy, sweet remembrance soothes,
With Virtue's kindling looks, his aching breast,
And turns his tears to rapture. Ask the crowd,
Which flies impatient from the village-walk
To climb the neighbouring cliff, when far below
The cruel wind has haled upon the coast
Some helpless bark: whilst sacred Pity melts
The general eye, or Terror's icy hand
Smiles their distorted limbs, or horent hair,
While every mother closer to her breast
Catches her child; and, pointing where the waves
Foam through the shattered vessel, shrieks aloud,
As one poor wretch, that spreads his piteous arms
For succour, swallowed by the roaring surge,
As now another, dashed against the rock,
Drops lifeless down. O deemest thou indeed
No kind endearment here, by nature given,
To mutual terror, and compassion's tears?
No sweetly melting softness, which attracts
O'er all that edge of pain, the social powers,
To this their proper action, and their end?”

The poet pursues the sentiment in the same animated imagery, describing the strong, but pleasurable, sensations which the soul feels, in reading the sufferings of heroes who nobly died in the cause of liberty and their country:

—“ When the pious band
Of youths, who fought for freedom, and their fires,
Lie side by side in gore.”

Or, in the strong movements of indignation and revenge against the tyrant, who invades that liberty, and enslaves their country.

—“ When the patriot's tear
Sars from thine eye, and thy extended arm
In fancy hurls the thunderbolt of Jove;
To fire the impious wreath on Pharaoh's brow,
Or dash Octavius from his triumphed car;
Say—Does thy secret soul require to taste
The big distress? Or, would'st thou then exchange
Thine heart-ennobling sorrows for the lot
Of him, who sits amid the gaudy herd
Of mute barbarians, bending to his nod,
And hears aloft his gold-invested front,
And says within himself, ‘I am a king,
And wherefore should the clamorous voice of woe
Intrude up on mine ear?’”

The sentiment of this charming and moral poet is, that sympathetic feelings are virtuous, and therefore pleasant. And from the whole, he deduces this important conclusion; that every virtuous emotion must be agreeable, and that this is the sanction and the reward of virtue. The thought is amiable; the conclusion noble: but still the solution appears to us to be imperfect.

We have already said, that the pleasure arising from the contemplation of distressful scenes is a compounded feeling, arising from several distinct sources in the human breast. The kind and degree of the sensation must depend upon the various blendings of the several ingredients which enter into the composition. The cause assigned by Mr Addison, the sense of our own security, may be supposed to have some share in the mass of feelings. That of Dr Akenfide may be allowed to have

Dist. etc.

have a still larger proportion. Let us attempt to trace some of the rest.

There are few principles in human nature of more general and important influence than that of sympathy. A late ingenious writer, led by the fashionable idea of simplifying all the springs of human nature into one source, has, in his beautiful Theory of Moral Sentiments, endeavoured to analyse a very large number of the feelings of the heart into sympathetic vibration. Though it appears to us most probable, that the human mind, like the human body, possesses various and distinct springs of action and of happiness, yet he has shown, in an amazing diversity of instances, the operation and importance of this principle of human nature. Let us apply it to our present subject.

We naturally sympathize with the passions of others. But if the passions they appear to feel be not those of mere distress alone; if, midst the scenes of calamity, they display fortitude, generosity, and forgiveness; if, "rising superior to the cloud of ills which covers them," they nobly stand firm, collected, and patient; here a still higher source of pleasure opens upon us, from complacency, admiration, and that unutterable sympathy which the heart feels with virtuous and heroic minds. By the operation of this principle, we place ourselves in their situation; we feel, as it were, some share of that conscious integrity and peace which they must enjoy. Hence, as before observed, the pleasure will vary, both as to its nature and degree, according to the scene and characters before us. The shock of contending armies in the field,—the ocean wrought to tempest, and covered with the wreck of shattered vessels,—and a worthy family silently, yet nobly, bearing up against a multitude of surrounding sorrows, will excite very different emotions, because the component parts of the pleasurable sensation consist of very different materials. They all excite admiration; but admiration, how diversified, both as to its degree and its cause! These several ingredients may doubtless be so blended together, that the pleasure shall make but a very small part of the mixed sensation. The more agreeable tints may bear little proportion to the terrifying red or the gloomy black.

In many of the instances which have been mentioned, the pleasure must arise chiefly, if not solely, from the circumstances or accompaniments of the scene. The sublime feelings excited by the view of an agitated ocean, relieve and soften those occasioned by the shipwreck. And the awe excited by the presence of thousands of men, acting as with one soul, and displaying magnanimity and firmness in the most solemn trial, tempers those sensations of horror and of pain which would arise from the field of battle.

The gratification we are attempting to account for, depends also, in a very considerable degree, upon a principle of human nature, implanted in it for the wisest ends; the exercise which it gives to the mind, by rousing it to energy and feeling. Nothing is so insupportable, as that languor and ennui, for the full expression of which our language does not afford a term. How agreeable it is, to have the soul called forth to exertion and sensibility, let the gamister witness, who, unable to endure the lassitude and sameness of unanimated luxury, runs with eagerness to the

place where probably await him all the irritation and agony of tumultuous passions.

Again; it is a law of our nature, that opposite passions, when felt in succession, and, above all, when felt at the same moment, heighten and increase each other. Ease succeeding pain, certainty after suspense, friendship after aversion, are unpeepably stronger than if they had not been thus contrasted. In this conflict of feelings, the mind rises from passive to active energy. It is roused to intense sensation; and it enjoys that peculiar, exquisite, and complex feeling, in which, as in many articles of our table, the acid and the sweet, the pleasurable and painful, pungencies are so happily mixed together, as to render the united sensation amazingly more strong and delightful.

We have not yet mentioned the principle of curiosity, that busy and active power, which appears so early, continues almost unimpaired so long, and to which, for the wisest ends, is annexed so great a sense of enjoyment. To this principle, rather than to a love of cruelty, would we ascribe that pleasure which children sometimes seem to feel from torturing flies and lesser animals. They have not yet formed an idea of the pain they inflict. It is, indeed, of unpeakable consequence, that this practice be checked as soon and as effectually as possible, because it is so important, that they learn to connect the ideas of pleasure and pain with the motions and actions of the animal creation. And to this principle may we also refer no small share of that pleasure in the contemplation of distressful scenes, the springs of which, in the human heart, we are now endeavouring to open.

To curiosity, then—to sympathy—to mental exertion—to the idea of our own security—and to the strong feelings occasioned by viewing the actions and passions of mankind in interesting situations, do we ascribe that gratification which the mind feels from the survey of many scenes of sorrow. We have called it a *pleasure*; but it will approach towards, or recede from, pleasure, according to the nature and proportion of the ingredients of which the sensation is composed. In some cases, pain will predominate. In others, there will be exquisite enjoyment.

The final cause of this constitution of the human mind is probably, that by means of this strong sensation, the soul may be preserved in continual and vigorous motion—that its feelings may be kept lively and tender—that it may learn to practise the virtues it admires—and to assist those to whom its sympathy can reach—and that it may thus be led, by these social exercises of the heart, to soften with compassion—to expand with benevolence—and generously to assist in every case, in which assistance can be given. An end this sufficient,

— "To assert eternal Providence,
And justify the ways of God to man."

DISTRESS, in law, the seizing or distraining any thing for rent in arrear, or other duty unperformed.

The effect of this distress is to compel the party either to replevy the things distrained, and contest the taking, in an action of trespass against the distrainer; or rather to oblige him to compound and pay the debt or duty for which he was so distrained.

There are likewise compulsory distresses in actions,

Distress.

Distress
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Ditch.

to cause a person appear in court; of which kind there is a distress personal of one's moveable goods, and the profits of his lands, for contempt in not appearing after summons: there is likewise distress real, of a person's immovable goods. In these cases none shall be distressed to answer for any thing touching their freedoms, but by the king's writ.

Distress may be either finite or infinite. Finite distress is that which is limited by law, in regard to the number of times it shall be made, in order to bring the party to a trial of the action. Infinite distress is that which is without any limitation, being made till the person appears: it is farther applied to jurors that do not appear; as, upon a certificate of assize, the process is *venire facias, habeas corpus*, and distress infinite.

It is also divided into grand distress and ordinary distress; of these the former extends to all the goods and chattels that the party has within the county. A person, of common right, may distress for rents and all manner of services; and where a rent is reserved on a gift in tail, lease for life, or years, &c. though there be no clause of distress in the grant or lease, so as that he has the reversion; but on a feoffment made in fee, a distress may not be taken, unless it be expressly reserved in the deed.

DISTRIBUTION, in a general sense, the act of dividing a thing into several parts, in order to the disposing each in its proper place.

DISTRIBUTION, in architecture, the dividing and disposing the several parts and pieces which compose a building, as the plan directs. See ARCHITECTURE.

DISTRIBUTION, in rhetoric, a kind of description, whereby an orderly division and enumeration is made of the principal qualities of the subject. David supplies us with an example of this kind, when, in the heat of his indignation against sinners, he gives a description of their iniquity: "Their throat is an open sepulchre; they flatter with their tongues; the poison of asps is under their lips; their mouth is full of cursing and lies; and their feet are swift to shed blood."

DISTRIBUTION, in printing, the taking a form asunder, separating the letters, and disposing them in the cases again, each in its proper cell. See PRINTING.

DISTRICT, in geography, a part of a province, distinguished by peculiar magistracies, or certain privileges; in which sense it is synonymous with hundred. See HUNDRED.

DISTRINGAS, in law, a writ commanding the sheriff, or other officer, that he distress a person for debt to the king, &c. or for his appearance at a certain day.

DISTRINGAS Juratores, a writ directed to the sheriff, whereby he is commanded to distress upon a jury to appear, and to return issues on their lands, &c. for non-appearance. This writ of distringas juratores issues for the sheriff to have their bodies in court, &c. at the return of the writ.

DITCH, a common fence or inclosure in marshes, or other wet land where there are no hedges. They allow these ditches six feet wide against highways that are broad; and against commons, five feet. But the common ditches about inclosures, dug at the bottom of the bank on which the quick is raised, are three feet wide at the top, one at the bottom, and two feet deep. By this means each side has a slope, which is of great

advantage; for where this is neglected, and the ditches dug perpendicular, the sides are always washing down, besides, in a narrow bottomed ditch, if cattle get down into it, they cannot stand to turn themselves to crop the quick: but where the ditch is four feet wide, it should be two and a half deep; and where it is five wide, it should be three deep; and so in proportion.

Ditch-Water is often used as an object for the microscope, and seldom fails to afford a great variety of animalcules. This water very often appears of a yellowish, greenish, or reddish colour; and this is wholly owing to the multitudes of animals of those colours which inhabit it. These animals are usually of the shrimp kind: and Swammerdam, who very accurately examined them, has called them, from the figure of their horns, *pulex aquaticus arborescens*. They copulate in May or June; and are often so numerous at that season, that the whole body of the water they are found in, is seen to be of a red, green, or yellowish colour, according to the colours of their bodies. The green thin scum also, so frequently seen on the surface of standing waters in summer, is no other than a multitude of small animalcules of this or some of the other kinds. Dunghill water is not less full of animals than that of ditches; and is often found so thronged with animalcules, that it seems altogether alive: it is then so very much crowded with these creatures, that it must be diluted with clear water before they can be distinctly viewed. There are usually in this fluid a sort of cels, which are extremely active; and besides these and many other of the common inhabitants of fluids, there is one species found in this which seems peculiar to it: the middle part of them is dark and beset with hairs, but the ends are transparent; their tails are tapering, with a long sprig at the extremity, and their motion is slow and waddling. See ANIMALCULE.

DITCH, in fortification, called also *foss* and *moat*, a trench dug round the rampart or wall of a fortified place, between the scarp and counter-scarp. See FORTIFICATION.

DITHYRAMBUS, in ancient poetry, a hymn in honour of Bacchus, full of transport and poetical rage.

This poetry owes its birth to Greece, and to the transports of wine; and yet art is not quite exploded, but delicately applied to guide and restrain the dithyrambic impetuosity, which is indulged only in pleasing flights. Horace and Aristotle tell us, that the ancients gave the name of dithyrambus to those verses wherein none of the common rules or measures were observed. As we have now no remains of the dithyrambus of the ancients, we cannot say exactly what their measure was.

DITONE, in music, an interval comprehending two tones. The proportion of the sounds that form the ditone is 4 : 5, and that of the semitone is 5 : 6.

DITRIHEDRIA, in mineralogy, a genus of spars with twice three sides, or six planes; being formed of two trigonal pyramids joined base to base, without any intermediate column. See SPAR.

The species of ditrihedria are distinguished by the different figures of these pyramids.

DITTÄNDER, in botany: See LEPIDIUM.

DITTANY, in botany. See DICTAMNUS.

DITTO, in books of accounts, usually written D^o, signifies the aforementioned. The word is corrupted from

Ditch
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Ditto.

Dival
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Diversify-
ing.

from the Italian *detto*, "the said;" as in our law-phrase, "the said premises," meaning the same as were aforementioned.

DIVAL, in heraldry, the herb nightshade, used by such as blazon by flowers and herbs, instead of colours and metals, for fable or black.

DIVALIA, in antiquity, a feast held among the ancient Romans, on the 21st day of December, in honour of the goddess Angerona; whence it is also called *Angeronalia*.—On the day of this feast, the pontifices performed sacrifice in the temple of Voluptia, or the goddess of joy and pleasure; who, some say, was the same with Angerona, and supposed to drive away all the sorrows and chagrins of life.

DIVAN, a council-chamber or court of justice among the eastern nations, particularly the Turks.—The word is Arabic, and signifies the same with *sofa* in the Turkish dialect.

There are two sorts of divans; that of the grand signior, called the *council of state*, which consists of seven of the principal officers of the empire; and that of the grand vizir, composed of six other vizirs or counsellors of state, the chancellor, and secretaries of state, for the distribution of justice.

The word is also used for a hall in the private houses of the orientals. The custom of China does not allow the receiving of visits in the inner parts of the house, but only at the entry, in a divan contrived on purpose for ceremonies.

Travellers relate wonders of the silence and expedition of the divans of the East.

DIVAN-Beghi, the superintendent of justice in Persia, whose place is the last of the six ministers of the second rank, who are all under the athemadabul or first minister. To this tribunal of the divan-beghi he appeals from sentences passed by the governors. He has a fixed stipend of 50,000 crowns for administering justice. All the sergeants, ushers, &c. of the court are in his service. He takes cognizance of the criminal causes of the chams, governors, and other great lords of Persia, when accused of any fault. There are divan-beghis not only at court and in the capital, but also in the provinces and other cities of the empire. The alcoran is the sole rule of his administration of justice, which also he interprets at pleasure. He takes no cognizance of civil causes; but all differences arising between the officers of the king's household and between foreign ministers are determined by him.

DIVANDUROW, the name of seven islands which lie a league north of the Maldives, and 24 from the coast of Malabar, almost opposite to Cananor.

DIVER, in ornithology. See *COLYMBUS*.

DIVERGENT, *ODIVERGING*, *LINES*, in geometry, are those which constantly recede from each other.

DIVERGENT *RAYS*, in optics, are those which, going from a point of the visible object, are dispersed, and continually depart one from another, in proportion as they are removed from the object: in which sense it is opposed to convergent. See *OPTICS*.

DIVERSIFYING, in rhetoric, is of infinite service to the orator; it is an accomplishment essential to his character, and may fitly be called the subject of all his tropes and figures. Vossius lays down six ways of diversifying a subject. 1. By enlarging on what was briefly mentioned before. 2. By a concise enumeration

of what had been insisted on at length. 3. By adding something new to what is repeated. 4. By repeating only the principal heads of what had been said. 5. By transposing the words and periods. 6. By imitating them.

DIVERSION, in military affairs, is when an enemy is attacked in one place where they are weak and unprovided, in order to draw off their forces from another place where they have made or intend to make an irruption. Thus the Romans had no other way in their power of driving Hannibal out of Italy, but by making a diversion in attacking Carthage.

DIVESTING, properly signifies undressing, or stripping off one's garment; in contradistinction from investing.

In law, it is used for the act of surrendering or relinquishing one's effects. By a contract of donation or sale, the donor or seller is said to be divested and divested of their property in such a commodity, and the donee or purchaser becomes invested therewith. See *INVESTITURE*.

A *demise* is a general divestiture which the fathers and mothers make of all their effects in favour of their children.

DIVIDEND, in arithmetic, the number proposed to be divided into equal parts. See *ARITHMETIC*, n° 14.

DIVIDEND of *Stocks*, is a share or proportion of the interest of stocks erected on public funds, as the fourths, &c. divided among and paid to the adventurers half-yearly.

DIVINATION, the knowledge of things obscure or future, which cannot be attained by any natural means.

It was a received opinion among the heathens, that the gods were wont to converse familiarly with some men, whom they endowed with extraordinary powers, and admitted to the knowledge of their councils and designs. Plato, Aristotle, Plutarch, Cicero, and others, divide divination into two sorts or species, *viz.* natural and artificial.

The former was so called, because not attained by any rules or precepts of art, but infused or inspired into the diviner, without his taking any further care about it than to purify and prepare himself for the reception of the divine afflatus. Of this kind were all those who delivered oracles, and foretold future events by inspiration, without observing external signs or accidents.

The second species of divination was called *artificial*, because it was not obtained by immediate inspiration, but proceeded upon certain experiments and observations arbitrarily instituted, and mostly superstitious. Of this sort there were various kinds, as by sacrifices, entrails, flame, cakes, flour, wine, water, birds, lots, verses, omens, &c.

In holy scripture we find mention made of nine different kinds of divination. The first performed by the inspection of planets, stars, and clouds: it is supposed to be the practicers of this whom Moses calls מְנַחֲשֵׁי מַעַן, of מְנַחֲשֵׁי מַעַן, "cloud," Deuter. ch. xviii. v. 10. 2. Those whom the prophet calls in the same place מְנַחֲשֵׁי מַעַן, which the vulgar and generality of interpreters render *augur*. 3. Those who in the same place are called מְנַחֲשֵׁי מַעַן, which the septuagint and

Divination. and vulgate translate "a man given to ill practices."

4. Such authors whom Moses in the same chapter, ver. 11. calls *hobber*. 5. Those who consult the spirits called *Pythia*; or, as Moses expresses it in the same book, אִנְיֹאֵל "those who ask questions of Pythia." 6. Witches or magicians, whom Moses calls יִדְּיֵי jūdōni. 7. Those who consult the dead, *necromancers*. 8. The prophet Hosea, chap. iv. ver. 12. mentions such as consult slaves, שְׂמָלִי קָנִי; which kind of divination may be called *rhabdomancy*. 9. The last kind of divination mentioned in scripture is *hepatoscopy*, or the consideration of the liver.

Divination of all kinds was necessarily made an occult science, which naturally remained in the hands of the priests and priestesses, the magi, the soothsayers, the augurs, the visionaries, the priests of the oracles, the false prophets, and other like professors, till the time of the coming of Jesus Christ. The light of the gospel, it is true, has dissipated much of this darkness; but it is more difficult, than is commonly conceived, to eradicate from the human mind a deep-rooted superstition, even though the truth be set in the strongest light, especially when the error has been believed almost from the origin of the world: so we still find existing among us the remains of this pagan superstition, in the following chimeras, which enthusiastic and designing men have formed into arts and sciences; though it must be owned, to the honour of the 18th century, that the pure doctrines of Christianity, and the spirit of philosophy, which become every day more diffused, equally concur in banishing these visionary opinions. The vogue for these pretended sciences and arts, moreover, is past, and they can no longer be named without exciting ridicule in all sensible people. By relating them here, therefore, and drawing them from their obscurity, we only mean to show their futility, and to mark those rocks against which the human mind, without the assistance of a pilot, might easily run.

For the attaining of these supernatural qualifications, there are still existing in the world the remains of,

1. *Astrology*: a conjectural science which teaches to judge of the effects and influences of the stars; and to predict future events by the situation of the planets and their different aspects. It is divided into *natural astrology*, or *meteorology*; which is confined to the foretelling of natural effects, as the winds, rain, hail, and snow, frosts and tempests. In this consists one branch of the art of almanack-makers; and by merely confronting these predictions in the kalendar, with the weather each day produces, every man of sense will see what regard is to be paid to this part of astrology. The other part, which is called *judicial astrology*, is still far more illusive and rash than the former: and having been at first the wonderful art of visionaries, it afterwards became that of impostors; a very common fate with all those chimerical sciences, of which we shall here speak. This art pretends to teach the method of predicting all sorts of events that shall happen upon the earth, as well such as relate to the public as to private persons; and that by the same inspection of the stars and planets and their different constellations. The *cabala* signifies, in like manner, the knowledge of things that are above the moon, as the celestial bodies

and their influences; and in this sense it is the same Divination. with judicial astrology, or makes a part of it.

2. *Horoscopy*, which may also be considered as a part of astrology, is the art by which they draw a figure, or celestial scheme, containing the 12 houses, wherein they mark the disposition of the heavens at a certain moment; for example, that at which a man is born, in order to foretell his fortune, or the incidents of his life. In a word, it is the disposition of the stars and planets at the moment of any person's birth. But as there cannot be any probable or possible relation between the constellations and the human race, all the principles they lay down, and the prophecies they draw from them, are chimerical, false, absurd, and a criminal imposition on mankind.

3. The art of *augury* consisted, among the ancient Romans, in observing the flight, the singing and eating of birds, especially such as were held sacred. See AUGURY.

4. The equally deceitful art of *haruspicy* consisted, on the contrary, in the inspection of the bowels of animals, but principally of victims; and from thence predicting grand incidents relative to the republic, and the good or bad events of its enterprises.

5. *Aeromancy* was the art of divining by the air. This vain science has also come to us from the Pagans: but is rejected by reason as well as Christianity, as false and absurd.

6. *Pyromancy* is a divination made by the inspection of a flame, either by observing to which side it turns, or by throwing into it some combustible matter, or a bladder filled with wine, or any thing else from which they imagined they were able to predict.

7. *Hydromancy* is the supposed art of divining by water. The Persians, according to Varro, invented it; Pythagoras and Numa Pompilius made use of it; and we still admire the like wonderful prognosticators.

8. *Geomancy* was a divination made by observing of cracks or clefts in the earth. It was also performed by points made on paper, or any other substance, at a venture; and they judged of future events from the figures that resulted from thence. This was certainly very ridiculous; but it is nothing less so to pretend to predict future events by the inspection of the grounds of a dish of tea or coffee, or by cards, and many other like matters.—Thus have designing men made use of the four elements to deceive their credulous brethren.

9. *Chiromancy* is the art which teaches to know, by inspecting the hand, not only the inclinations of a man, but his future destiny also. The fools or impostors who practise this art pretend, that the different parts or the lines of the hand have a relation to the internal parts of the body, as some to the heart, others to the liver, spleen, &c. On this false supposition, and on many others equally extravagant, the principles of chiromancy are founded: and on which, however, several authors, as Robert Flud an Englishman, Artemidorus, M. de la Chambre, John of Indagina, and many others, have written large treatises.

10. *Physiognomy*, or *physiognomancy*, is a science that pretends to teach the nature, the temperament, the understanding, and the inclinations of men, by the inspection

Divine,
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Diving.

spection of their countenances, and is therefore very little less frivolous than chiromancy; though Aristotle, and a number of learned men after him, have written express treatises concerning it.

DIVINE, something relating to God. The word is also used, figuratively, for any thing that is excellent, extraordinary, and that seems to go beyond the power of nature and the capacity of mankind. In which sense, the compass, telescope, clocks, &c. are said to be *divine inventions*: Plato is called the *divine author*, the *divine Plato*; and the same appellation is given to Seneca: Hippocrates is called, "the divine old man," *divinus senex*, &c.

DIVING, the art or act of descending under water to considerable depths, and abiding there a competent time.

The uses of diving are very considerable, particularly in the fishing for pearls, corals, sponges, &c. See *PEARL-Fishing*, &c.

There have been various methods proposed, and machines contrived, to render the business of diving more safe and easy. The great point is to furnish the diver with fresh air; without which, he must either make a short stay or perish.

Those who dive for sponges in the Mediterranean, help themselves by carrying down sponges dipt in oil in their mouths. But considering the small quantity of air that can be contained in the pores of a sponge, and how much that little will be contracted by the pressure of the incumbent water, such a supply cannot long subsist the diver. For it is found by experiment, that a gallon of air included in a bladder, and by a pipe reciprocally inspired and expired by the lungs, becomes unfit for respiration in little more than one minute of time. For though its elasticity be but little altered in passing the lungs, yet it loses its vivifying spirit, and is rendered effect.

In effect, a naked diver, Dr Halley assures us, without a sponge, cannot remain above a couple of minutes inclosed in water, nor much longer with one, without suffocating; nor, without long practice, near so long; ordinary persons beginning to rise in about half a minute. Besides, if the depth be considerable, the pressure of the water in the vessels makes the eyes blood-shot, and frequently occasions a spitting of blood.

Hence, where there has been occasion to continue long at the bottom, some have contrived double flexible pipes, to circulate air down into a cavity, inclosing the diver as with armour, both to furnish air and to bear off the pressure of the water, and give leave to his breast to dilate upon inspiration; the fresh air being forced down one of the pipes with bellows, and returning by the other of them, not unlike to an artery and vein.

But this method is impracticable when the depth surpasses three fathoms; the water embracing the bare limbs so closely as to obstruct the circulation of the blood in them; and withal pressing so strongly on all the junctures where the armour is made tight with leather, that, if there be the least defect in any of them, the water rushes in, and instantly fills the whole engine, to the great danger of the diver's life.

It is certain, however, that people, by being accustomed to the water from their infancy, will at length

be enabled, not only to stay much longer under water than the time above mentioned, but put on a kind of amphibious nature, so that they seem to have the use of all their faculties as well when their bodies are immersed in water as when they are on dry land. Most savage nations are remarkable for this. According to the accounts of our late voyagers, the inhabitants of the South-sea islands are such expert divers, that when a nail or any piece of iron was thrown overboard, they would instantly jump into the sea after it, and never failed to recover it, notwithstanding the quick descent of the metal. Even among civilized nations, many persons have been found capable of continuing an incredible length of time below water. The most remarkable instance of this kind is the famous Sicilian diver Nicolo Pelice. The authenticity of the account, indeed, depends entirely on the authority of F. Kircher. He assures us, that he had it from the archives of the kings of Sicily: but, notwithstanding this assertion, the whole hath so much of the marvellous in it, that we believe there are few who will not look upon it to have been exaggerated. "In the times of Frederic king of Sicily (says Kircher), there lived a celebrated diver, whose name was *Nicholas*, and who, from his amazing skill in swimming, and his perseverance under water, was surnamed the *fish*. This man had from his infancy been used to the sea; and earned his scanty subsistence by diving for corals and oysters, which he sold to the villagers on shore. His long acquaintance with the sea, at last, brought it to be almost his natural element. He was frequently known to spend five days in the midst of the waves, without any other provisions than the fish which he caught there and ate raw. He often swam over from Sicily into Calabria, a tempestuous and dangerous passage, carrying letters from the king. He was frequently known to swim among the gulphs of the Lipari islands, noway apprehensive of danger.

"Some mariners out at sea, one day observed something at some distance from them, which they regarded as a sea-monster; but upon its approach it was known to be *Nicholas*, whom they took into their ship. When they asked him whither he was going in so stormy and rough a sea, and at such a distance from land, he showed them a packet of letters, which he was carrying to one of the towns of Italy, exactly done up in a leather bag, in such a manner as that they could not be wetted by the sea. He kept them thus company for some time in their voyage, conversing, and asking questions; and after eating an hearty meal with them, he took his leave, and, jumping into the sea, pursued his voyage alone.

"In order to aid these powers of enduring in the deep, nature seemed to have assisted him in a very extraordinary manner: for the spaces between his fingers and toes were webbed, as in a goose; and his chest became so very capacious, that he could take in, at one inspiration, as much breath as would serve him for a whole day.

"The account of so extraordinary a person did not fail to reach the king himself; who commanded *Nicholas* to be brought before him. It was no easy matter to find *Nicholas*, who generally spent his time in the solitudes of the deep; but, at last, after much searching, he was found, and brought before his majesty.

Diving.

Diving.

fly. The curiosity of this monarch had been long excited by the accounts he had heard of the bottom of the gulph of Charybdis; he now therefore conceived, that it would be a proper opportunity to have more certain information. He therefore commanded our poor diver to examine the bottom of this dreadful whirlpool; and as an incitement to his obedience, he ordered a golden cup to be flung into it. Nicholas was not infensible of the danger to which he was exposed; dangers best known only to himself; and therefore he presumed to remonstrate: but the hopes of the reward, the desire of pleasing the king, and the pleasure of showing his skill, at last prevailed. He instantly jumped into the gulph, and was as instantly swallowed up in its bosom. He continued for three quarters of an hour below; during which time the king and his attendants remained on shore, anxious for his fate; but he at last appeared, holding the cup in triumph in one hand, and making his way good among the waves with the other. It may be supposed he was received with applause when he came on shore: the cup was made the reward of his adventure; the king ordered him to be taken proper care of; and, as he was somewhat fatigued and debilitated by his labour, after an hearty meal he was put to bed, and permitted to refresh himself by sleeping.

"When his spirits were thus restored, he was again brought to satisfy the king's curiosity with a narrative of the wonders he had seen; and his account was to the following effect. He would never, he said, have obeyed the king's commands, had he been apprised of half the dangers that were before him. There were four things, he said, which rendered the gulph dreadful, not only to men, but to fishes themselves. 1. The force of the water bursting up from the bottom, which required great strength to resist. 2. The abruptness of the rocks that on every side threatened destruction. 3. The force of the whirlpool dashing against those rocks. And, 4. The number and magnitude of the polyopus fish, some of which appeared as large as a man; and which, every where sticking against the rocks, projected their fibrous arms to entangle him. Being asked how he was able so readily to find the cup that had been thrown in, he replied, that it happened to be flung by the waves into the cavity of a rock against which he himself was urged in his descent. This account, however, did not satisfy the king's curiosity. Being requested to venture once more into the gulph for further discoveries, he at first refused; but the king, desirous of having the most exact information possible of all things to be found in the gulph, repeated his solicitations; and, to give them still greater weight, produced a larger cup than the former, and added also a purse of gold. Upon these considerations the unfortunate diver once again plunged into the whirlpool, and was never heard of more."

To obviate the inconveniences of diving to those who have not the extraordinary powers of the diver above mentioned, different instruments have been contrived. The chief of these is the diving bell; which is most conveniently made in form of a truncated cone, the smaller base being closed, and the larger open. It is to be poised with lead; and so suspended, that the vessel may sink full of air, with its open basis down-

ward, and as near as may be in a situation parallel to the horizon, so as to clove with the surface of the water all at once.

Under this coverle the diver sitting, sinks down with the included air to the depth desired: and if the cavity of the vessel can contain a tun of water, a single man may remain a full hour, without much inconvenience, at five or six fathoms deep. But the lower you go, still the included air contracts itself according to the weight of the water which compresses it: so that at 33 feet deep the bell becomes half full of water, the pressure of the incumbent water being then equal to that of the atmosphere; and at all other depths the space occupied by the compressed air in the upper part of the bell will be to the under part of its capacity filled with water, as 33 feet to the surface of the water in the bell below the common surface thereof. And this condensed air being taken in with the breath soon insinuates itself into all the cavities of the body, and has no ill effect, provided the bell be permitted to descend so slowly as to allow time for that purpose. One inconvenience that attends it, is found in the ears, within which there are cavities which open only outwards, and that by pores so small as not to give admission even to the air itself, unless they be dilated and distended by a considerable force. Hence, on the first descent of the bell, a pressure begins to be felt on each ear; which, by degrees, grows painful, till the force overcoming the obstacle, what contringes these pores yields to the pressure, and letting some condensed air slip in, presently eases the pain. The bell descending lower, the pain is renewed, and again eased in the same manner.

But the greatest inconvenience of this engine is, that the water entering it, contracts the bulk of air into so small a compass, that it soon heats and becomes unfit for respiration: so that there is a necessity for its being drawn up to recruit it; besides the uncomfortable abiding of the diver almost covered with water.

To obviate the difficulties of the diving-bell, Dr Hally, to whom we owe the preceding account, contrived some further apparatus, whereby not only to recruit and refresh the air from time to time, but also to keep the water wholly out of it at any depth. The manner in which this was effected, he relates in the following words.

"The bell I made use of was of wood, containing about 60 cubic feet in its concavity; and was of the form of a truncate cone, whose diameter at the top was three feet, and at the bottom five. This I coated with lead so heavy that it would sink empty; and I distributed the weight so about its bottom, that it would go down in a perpendicular direction, and no other. In the top I fixed a strong but clear glass, as a window, to let in the light from above; and likewise a cock to let out the hot air that had been breathed: and below, about a yard under the bell, I placed a stage which hung by three ropes, each of which was charged with about one hundred weight to keep it steady. This machine I suspended from the mast of a ship by a sprit, which was sufficiently secured by stays to the mast-head, and was directed by braces to carry it overboard clear of the ship's side, and to bring it again within board as occasion required.

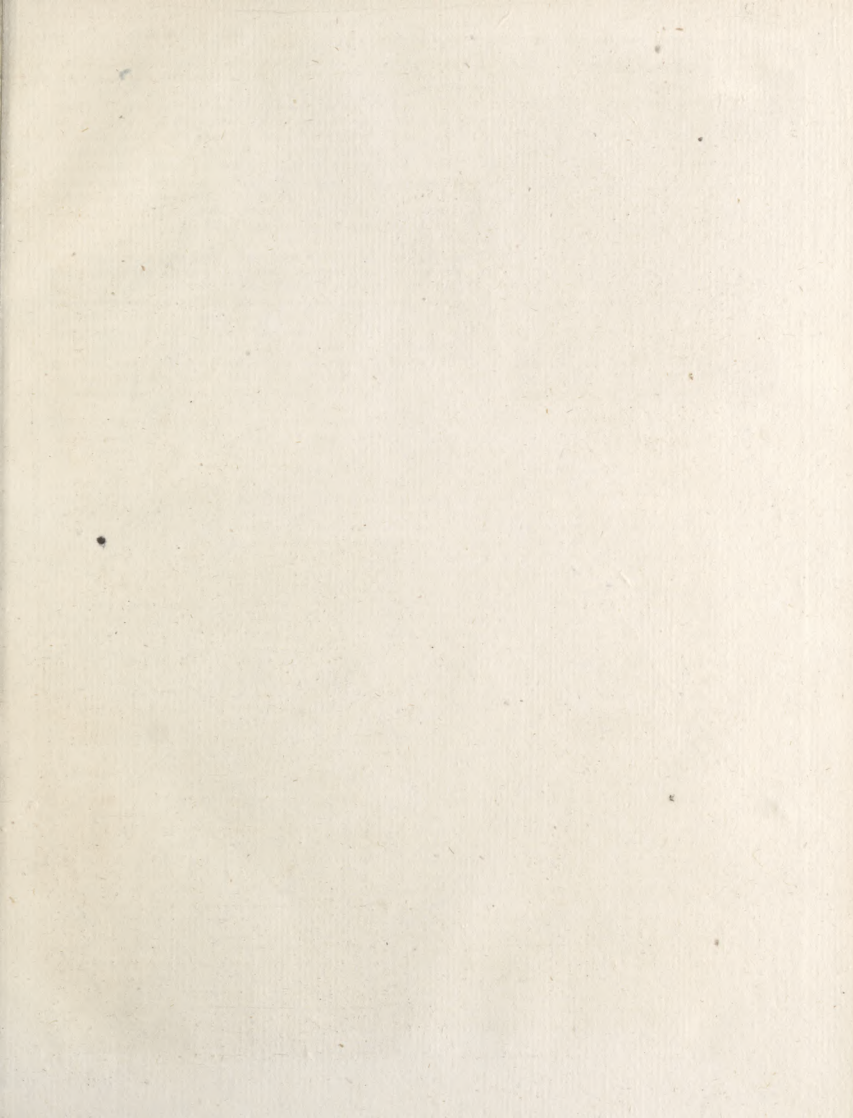


Fig. 1. Haller's
DIVING BELL.

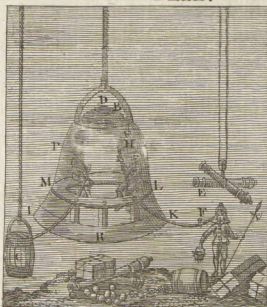
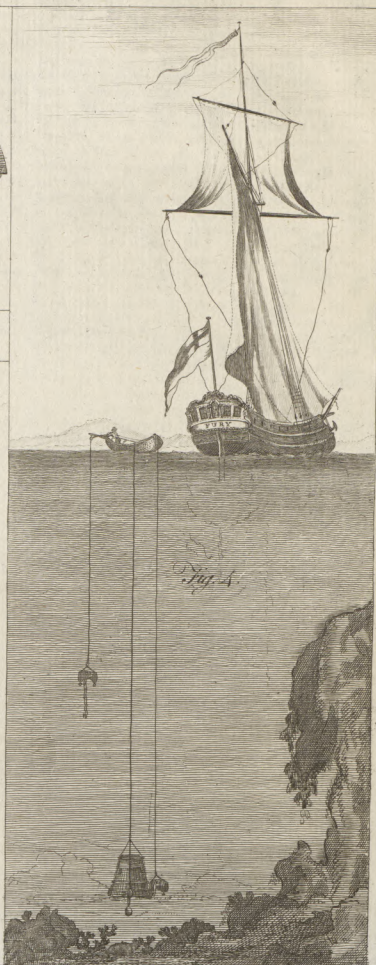
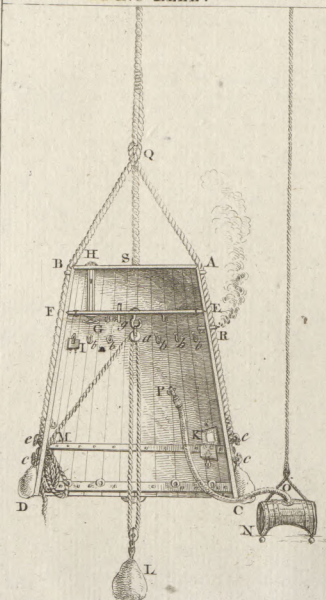


Fig. 2.
Frivalds.



Fig. 3. Spalding's
DIVING BELL.



Diving.

"To supply air to this bell when under water, I caused a couple of barrels of about 36 gallons each to be cased with lead, so as to sink empty; each of them having a bung-hole in its lowest parts to let in the water, as the air in them condensed on their descent; and to let it out again when they were drawn up full from below. And to a hole in the uppermost part of these barrels, I fixed a leathern trunk or hose well li-quored with bees wax and oil, and long enough to fall below the bung-hole, being kept down by a weight appended: so that the air in the upper part of the barrels could not escape, unless the lower ends of these hose were first lifted up.

"The air-barrels being thus prepared, I fitted them with tackle proper to make them rise and fall alternately, after the manner of two buckets in a well; which was done with so much ease, that two men, with less than half their strength, could perform all the labour required: and in their descent they were directed by lines fastened to the under edge of the bell, the which passed through rings on both sides the leathern hose in each barrel; so that, sliding down by these lines, they came readily to the hand of a man who stood on the stage on purpose to receive them, and to take up the ends of the hose into the bell. Through these hose, as soon as their ends came above the surface of the water in the barrels, all the air that was included in the upper parts of them was blown with great force into the bell; whilst the water entered at the bung-holes below, and filled them: and as soon as the air of one barrel had been thus received, upon a signal given, that was drawn up, and at the same time the other descended; and, by an alternate succession, furnished air so quick, and in so great plenty, that I myself have been one of five who have been together at the bottom in nine or ten fathom water, for above an hour and an half at a time, without any sort of ill consequence: and I might have continued there as long as I pleased, for any thing that appeared to the contrary. Besides, the whole cavity of the bell was kept entirely free from water, so that I sat on a bench which was diametrically placed near the bottom, wholly dressed, with all my cloaths on. I only observed, that it was necessary to let down gradually at first, as about 12 feet at a time; and then to stop and drive out the air that entered, by receiving three or four barrels of fresh air before I descended further. But being arrived at the depth designed, I then let out as much of the hot air that had been breathed, as each barrel would replenish with cool, by means of the cock at the top of the bell; through whose aperture, though very small, the air would rush with so much violence, as to make the surface of the sea boil, and to cover it with a white foam, notwithstanding the weight of the water over us.

"Thus I found that I could do any thing that required to be done just under us; and that, by taking off the stage, I could, for a space as wide as the circuit of the bell, lay the bottom of the sea so far dry, as not to be overbores thereon. And, by the glass window, so much light was transmitted, that when the sea was clear, and especially when the sun shone, I could see perfectly well to write or read; much more to listen or lay hold on any thing under us that was

to be taken up. And, by the return of the air-barrels, I often sent up orders written with an iron pen, on small plates of lead, directing how to move us from place to place as occasion required. At other times, when the water was troubled and thick, it would be as dark as night below; but in such cases I have been able to keep a candle burning in the bell as long as I pleased, notwithstanding the great expence of air necessary to maintain flame.—By an additional contrivance, I have found it not impracticable for a diver to go out of an engine to a good distance from it, the air being conveyed to him with a continued stream, by small flexible pipes; which pipes may serve as a clue, to direct him back again when he would return to the bell."

Plate CLXIII. fig. 1. shows Dr Halley's diving bell, with the divers at work. DBLKRIMP represents the body of the bell. D, the glass which serves as a window. B, the cock for letting out the air which has been breathed. LM, the seats. C, one of the air-barrels. P, H, two of the divers. F, another diver at a distance from the bell, and breathing through the flexible tube K.—This diver is supposed to have a head-piece of lead, made to fit quite close about his shoulders: this head-piece was capable of containing as much air as would supply him for a minute or two. When he had occasion for more air, he turned a cock at F, by which means a communication was opened with the air in the bell, and thus he could receive a new supply at pleasure.

Since the invention of this diving machine, there has been one contrived by Mr Triewald, F. R. S. and military architect to the king of Sweden, which, for a single person, is in some respects thought to be more eligible than Dr Halley's, and is constructed as follows. AB is the bell, which is sunk by lead weights DD hung to its bottom. This bell is of copper, and tinned all over in the inside, which is illuminated by three strong convex lenses, G, G, G, with copper lids H, H, H, to defend them. The iron ring or plate E serves the diver to stand on when he is at work; and is suspended at such a distance from the bottom of the bell by the chains F, F, F, that when the diver stands upright, his head is just above the water in the bell, where the air is much better than higher up, because it is colder, and consequently more fit for respiration. But as the diver must always be within the bell, and his head of course in the upper part, the inventor has contrived, that even there, when he has breathed the hot air as well as he can, he may, by means of a spiral copper tube bc, placed close to the inside of the bell, draw the cooler and fresher air from the lowermost parts: for which purpose, a flexible leather tube, about two feet long, is fixed to the upper end of the copper tube at b; and to the other end of this tube is fixed an ivory mouth-piece, by which the diver draws in the air.

The greatest improvement, however, which the diving bell ever received, or probably can receive, was from the late Mr Spalding of Edinburgh. A section of his improved diving-bell is represented in fig. 3. This construction is designed to remedy some inconveniences of Dr Halley's, which are very evident, and of very dangerous tendency. These are, 1. By Dr Halley's construction, the sinking or raising of the bell depends en-tirely;

Diving.

Fig. 2s.

Fig. 3.

Diving.

tirely on the people who are at the surface of the water; and as the bell even when in the water has a very considerable weight, the raising it not only requires a great deal of labour, but there is a possibility of the rope breaking by which it is raised, and thus every person in the bell would inevitably perish. 2. As there are, in many places of the sea, rocks which lie at a considerable depth, the figure of which cannot possibly be perceived from above, there is danger that some of their ragged prominences may catch hold of one of the edges of the bell in its descent, and thus overset it before any signal can be given to those above, which would infallibly be attended with the destruction of the people in the bell; and as it must always be unknown, before trial, what kind of a bottom the sea has in any place, it is plain, that without some contrivance to obviate this last danger, the descent in Dr Halley's diving-bell is not at all eligible.

How these inconveniences are remedied by Mr Spalding's new construction will be easily understood from the following description.—ABCD represents a section of the bell, which is made of wood; *e, e*, are iron hooks, by means of which it is suspended by ropes QBF *e*, and QAE R *e*, and QS, as expressed in the figure: *e, e*, are iron hooks, to which are appended lead weights, that keep the mouth of the bell always parallel to the surface of the water, whether the machine taken altogether is lighter or heavier than an equal bulk of water. By these weights alone, however, the bell would not sink: another is therefore added, represented at L; and which can be raised or lowered at pleasure, by means of a rope passing over the pulley *a*, and fastened to one of the sides of the bell at M. As the bell descends, this weight, called by Mr Spalding the *balance weight*, hangs down a considerable way below the mouth of the bell. In case the edge of the bell is caught by any obstacle, the balance-weight is immediately lowered down so that it may rest upon the bottom. By this means the bell is lightened so that all danger of overletting is removed; for being lighter, without the balance-weight, than an equal bulk of water, it is evident that the bell will rise, as far as the length of the rope affixed to the balance-weight will allow it. This weight, therefore, will serve as a kind of anchor to keep the bell at any particular depth which the divers may think necessary; or by pulling it quite up, the descent may be continued to the very bottom.

By another very ingenious contrivance, Mr Spalding rendered it possible for the divers to raise the bell, with all the weights appended to it, even to the surface, or to stop at any particular depth, as they think proper; and thus they could fill be safe, even though the rope designed for pulling up the bell was broke. For this purpose the bell is divided into two cavities, both of which are made as tight as possible. Just above the second bottom E F, are small slits in the sides of the bell; through which the water, entering as the bell descends, displaces the air originally contained in this cavity, which flies out at the upper orifice of the cock G H. When this is done, the divers turn the handle G, which stops the cock; so that if any more air was to get into the cavity AEFB, it could not longer be discharged through the orifice H as before. When this cavity is full of water, the bell

Diving.

sinks; but when a considerable quantity of air is admitted, it rises. If therefore the divers have a mind to raise themselves, they turn the small cock *g*, by which a communication is made between the upper and under cavities of the bell. The consequence of this is, that a quantity of air immediately enters the upper cavity, forces out a quantity of the water contained in it, and thus renders the bell lighter by the whole weight of the water which is displaced. Thus, if a certain quantity of air is admitted into the upper cavity, the bell will descend very slowly; if a greater quantity, it will neither ascend nor descend, but remain stationary; and if a larger quantity of air is still admitted, it will arise to the top. It is to be observed, however, that the air which is thus let out into the upper cavity must be immediately replaced from the air-barrel; and the air is to be let out very slowly, or the bell will rise to the top with so great velocity that the divers will be in danger of being shaken out of their seats. But, by following these directions, every possible accident may be prevented, and people may descend to great depths without the least apprehension of danger. The bell also becomes so easily manageable in the water, that it may be conducted from one place to another by a small boat with the greatest ease, and with perfect safety to those who are in it.

Instead of wooden seats used by Dr Halley, Mr Spalding made use of ropes suspended by hooks *bbb*; and on these ropes the divers may sit without any inconvenience. I and K are two windows made of thick strong glass, for admitting light to the divers. N represents an air-cask with its tackle, and OCP the flexible pipe through which the air is admitted to the bell. In the ascent and descent of this cask the pipe is kept down by a small weight appended, as in Dr Halley's machine. R is a small cock by which the hot air is discharged as often as it becomes troublesome. Fig. 4. is a representation of the whole diving apparatus, which it is hoped will be readily understood without any further explanation. Two air-barrels are represented in this figure; but Mr Spalding was of opinion, that one capable of containing 30 gallons is sufficient for an ordinary machine.

Fig. 4.

We are told of another method put in practice by a gentleman of Devonshire. He has contrived a large cask of strong leather, perfectly water-proof, which may hold about half a hoghead of air. This is so contrived, that, when he shuts himself up in this cask, he may walk at the bottom of the sea, and go into any part of a wrecked vessel, and deliver out the goods. This method, we are told, he has practised for many years, and has thus acquired a large fortune. It would be a considerable improvement on this machine to condense the air in it as much as possible before the diver descended; as he would thus be furnished with an atmosphere ended with elasticity sufficient to resist the weight of the water, which otherwise would squeeze his cask into much less room than it originally took up. The condensed air also would serve for respiration a much longer time than that which is in its ordinary state.

Diving-Bladder, a machine invented by Borelli, and by him preferred, though without any good reason, to the diving-bell. It is a globular vessel of brass or copper, about two feet in diameter, which contains the

Diving
||
Divisibility

the diver's head. It is fixed to a goat's-skin habit exactly fitted to his person. Within the vessel are pipes; by means of which a circulation of air is contrived; and the person carries an air-pump by his side, by which he can make himself heavier or lighter as fishes do, by contracting or dilating their air bladder. By this means he thought all the objections to which other diving machines are liable were entirely obviated, and particularly that of want of air; the air which had been breathed, being, as he imagined, deprived of its noxious qualities by circulating through the pipes. These advantages, however, it is evident, are only imaginary. The diver's limbs, being defended from the pressure of the water only by a goat's-skin, would infallibly be crushed if he descended to any considerable depth; and from the discoveries now made by Dr Priestley and others, it is abundantly evident, that air, which is once rendered foul by breathing, cannot in any degree be restored by circulation through pipes. Concerning the use of copper machines in general, Mr Spalding favoured us with the following curious observation, namely, That when a person has breathed in them a few minutes, he feels in his mouth a very disagreeable brassy taste, which continues all the time he remains in the vessel; so that, on this account, copper seems by no means an eligible material. This taste most probably arises from the action of the alkalescent effluvia of the body upon the copper; for volatile alkali is a strong dissolvent of this metal: but how these effluvia volatilise the copper in such a manner as to make the taste of it sensible in the mouth, it is not easy to say.

DIVINITY, properly signifies the nature, quality, and essence of God.

DIVINITY, is also used in the same sense with theology.

DIVISIBILITY, that property by which the particles of matter in all bodies are capable of a separation or disunion from each other.

The Peripatetics and Cartesians hold divisibility to be an affection of all matter. The Epicureans, again, allow it to agree to every physical continuum; but they deny that this affection agrees to all bodies, for the primary corpuscles or atoms they maintain to be perfectly infecible and indivisible.

As it is evident that body is extended, so it is no less evident that it is divisible: for since no two particles of matter can exist in the same place, it follows, that they are really distinct from each other; which is all that is meant by being divisible. In this sense the least conceivable particle must still be divisible, since it will consist of parts which will be really distinct. To illustrate this by a familiar instance. Let the least imaginable piece of matter be conceived lying on a smooth plain surface, it is evident the surface will not touch it every where: those parts therefore which it does not touch may be supposed separable from the others, and so on as far as we please; and this is all that is meant when we say matter is infinitely divisible.

The infinite divisibility of mathematical quantity is demonstrated thus geometrically. Suppose the line AC perpendicular to BF; and another, as GH, at a small distance from it, also perpendicular to the same line: with the centres CCC, &c. describe circles cutting the line GH in the points *eee*, &c. Now the

greater the radius AC is, the less is the part eH. But Divisibility, therefore, the part eH may be divided into still less portions; consequently it may be divided in infinitum. Division.

All that is supposed in strict geometry (says Mr Maclaurin) concerning the divisibility of magnitude, amounts to no more than that a given magnitude may be conceived to be divided into a number of parts equal to any given or proposed number. It is true, that the number of parts into which a given magnitude may be conceived to be divided, is not to be fixed or limited, because no given number is so great but a greater may be conceived and assigned: but there is not, therefore, any necessity of supposing the number of parts actually infinite; and if some have drawn very abusive consequences from such a supposition, yet geometry ought not to be loaded with them.

How far matter may actually be divided, may in some measure be conceived from hence, that a piece of wire gilt with so small a quantity as eight grains of gold, may be drawn out to a length of 13,000 feet, the whole surface of it still remaining covered with gold. We have also a surprising instance of the minuteness of some parts of matter from the nature of light and vision. Let a candle be lighted, and placed in an open plain, it will then be visible two miles round; and consequently was it placed two miles above the surface of the earth, it would fill with luminous particles a sphere whose diameter was four miles, and that before it had lost any sensible part of its weight. A quantity of vitriol being dissolved, and mixed with 9000 times as much water, will tinge the whole; consequently will be divided into as many parts as there are visible portions of matter in that quantity of water. There are perfumes, which, without a sensible diminution of their quantity, shall fill a very large space with their odiferous particles; which must therefore be of an inconceivable smallness, since there will be a sufficient number in every part of that space sensibly to affect the organ of smelling. Dr Keill demonstrates, that any particle of matter, how small soever, and any finite space, how large soever, being given, it is possible for that small particle of matter to be diffused through all that space, and to fill it in such a manner, as that there shall be no pore in it whose diameter shall exceed any given line.

The chief objections against the divisibility of matter in infinitum are, That an infinite cannot be contained by a finite; and that it follows from a divisibility in infinitum, either that all bodies are equal, or that one infinite is greater than another. But the answer to these is easy; for the properties of a determined quantity are not to be attributed to an infinite considered in a general sense; and who has ever proved that there could not be an infinite number of infinitely small parts in a finite quantity, or that all infinities are equal? The contrary is demonstrated by mathematicians in innumerable instances. See the article INFINITE, and 'S *Gravelsande Elem. Mathem.* l. i. c. 4.

DIVISION, in general, is the separating a thing into two or more parts.

Mechanical Division, signifies that separation which is occasioned in the parts of a body by help of mechanical instruments.—The mechanical division of bodies does

Division. does indeed separate them into smaller, homogeneous, similar parts; but this separation cannot extend to the primary integral molecules of any body; and consequently is incapable of breaking what is properly called their *aggregation*: also, no union is formed betwixt the divided and dividing bodies, in which respect division essentially differs from dissolution.

Division is not properly a chemical operation. It is only employed preparatorily to facilitate other operations, and particularly solution. For this purpose it is very useful, as it increases the quantity of surface, and consequently the points of contact of any body.—Different methods are used to divide bodies according to their nature. Those which are tenacious and elastic, as horns and gums, require to be cut, rasped, or filed. Metals, because of their ductility, require the same treatment: but as they are also fusible, they may be quickly and conveniently reduced into grains small enough for most operations, by pouring them, when melted, into water. All brittle bodies may be reduced conveniently into fine parts by being bruised in a mortar with a pestle. Very hard bodies, such as glass, crystals, stones, particularly those of the vitrifiable kind, before they are pounded, ought to be plunged when red-hot into water, by which they are split and cracked, and rendered more easily pulverable. Bodies of this kind may also be bruised or ground by means of a hard and flat stone, upon which the matter is to be put, and bruised by another hard stone so small as to be held and moved upon the larger stone with the hand. The larger stone is called a *porphyry*, from its being generally of that kind of stone; and the operation is called *porphyrisation*. Instead of porphyrisation, a mill may be used, composed of a hard grit millstone, moving round upon another stone of the same kind, which must be fixed: in the upper stone is a groove or channel, through which the matter to be ground passes. By this method a substance may be more quickly reduced to a fine powder than by porphyrisation. But these mills can be only employed for considerable quantities of matter.

These methods of mechanically dividing bodies are attended with some practical inconveniences; the most considerable of which is, that some parts of the dividing instruments are always struck off, and mixed with the matter to be divided. This may greatly affect the operations. For instance, instruments of iron and copper furnish metallic colouring particles, and copper is very prejudicial to health. Porphyry is coloured by a reddish brown matter, which injures the colour of crystal glasses, enamels, and porcelains made with matters ground upon this stone. These matters therefore must be cleaned after their porphyrisation, or else no instruments capable of injuring the intended operations ought to be employed. Thus, for the preparation of all medicines to be taken internally, no copper instruments, as mortars, pestles, &c. ought to be used; those made of iron are preferable; and instead of porphyries, mortars, grinding-stones and millstones made of hard and white stones ought to be employed for substances which are to enter into the composition of enamels, crystal glass, and porcelain, the whiteness of which is a most necessary quality.

Division, in algebra.—See *ALGEBRA*, p. 402.
Nº 102.

DIVISION, in arithmetic. See *ARITHMETIC*, n° II.
Divisions of an Army, in the military art, the several brigades and squadrons into which it is canon-

**Division
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Divorce.**

oned.
Divisions of a Battalion, are the several platoons into which it is divided in marching or firing, each of which is commanded by an officer.

DIVISION, in sea affairs, a select number of ships in a fleet or squadron of men of war, distinguished by a particular flag or pendant, and usually commanded by a general officer. A squadron is commonly ranged into three divisions, the commanding officer of which is always stationed in the centre.

When a fleet consists of 60 sail of the line, that is, of ships having at least 60 cannon each, the admiral divides it into three squadrons, each of which has its divisions and commanding officers. Each squadron has its proper colours, according to the rank of the admiral who commands it, and every division its proper mast. Thus the white flag denotes the first division of France; the white and blue the second; and the third is characterised by the blue. In Britain, the first admiral, or the admiral of the fleet, displays the union-flag at the main-top-mast head; next follows the white flag with St George's cross; and afterwards the blue. The private ships carry pendants of the same colour with their respective squadrons at the mast of their particular divisions; so that the last ship in the division of the blue squadron carries a blue pendant at her mizen-top-mast head.

DIVISOR, in arithmetic. See *ARITHMETIC*, n° II.
DIUM (anc. geog.), a town of Chalcidice in Macedonia, near mount Athos. Also a promontory of Crete, on the north side of the island.—A third *Dium*, a promontory of Eubœa; or a town of that name in Eubœa, near the promontory Cæneum, on the north-west side of the island, called also *Dia*.—A fourth *Dium* in Pieria of Macedonia, on the west side of the Sinus Thermaicus. Strabo and Livy place it on the borders of Pieria to the south, at the foot of mount Olympus towards Thessaly. That it was a splendid city, appears from Polybius; who relates, that its gymnasium and walls were overthrown by the Ætolians. From which overthrow, however, it again recovered, Alexander adding new splendor to it, by the brass statues cast by Lyfippus, and erected there in memory of the slain at the Granicus: an ornament which was continued down to the time of the Romans; who made it a colony, called *Dienfis*.—A fifth *Dium* beyond Jordan, near Pella in the Pireæ.

DIVODURUM (anc. geog.), a town of the Mediœmatriæ in Gallia Belgica; situated on the Moselle, in the spot where now Metz stands: now a city of Lorraine. E. Long. 6. o. Lat. 49. 16.

DIVORCE, a breach or dissolution of the bond of marriage. See *MARRIAGE*; and *LAW*, N° clx. 23.

Divorce is of two kinds: the one, a *vinculo matrimonii*, which alone is properly *divorce*; the other, a *mensa & thoro*, “a separation from bed and board.”

The woman divorced a *vinculo matrimonii* receives all again that she brought with her: the other has a suitable separate maintenance allowed her out of her husband's effects. The first only happens thro' some essential impediment, as consanguinity or affinity within the degrees forbidden,

Divorce. forbidden, pre-contract, impotency, adultery, &c. of which impediments the canon law allows 14, comprehended in these verses :

*Error, conditio, votum, cognatio, crimen,
Culius, disparitas, vis, ordo, ligamen, bonitas,
Si sit affinis, si forte viri sequatur,
Si parum et duplici dicit profectus teli,
Raptore sit mulier, nec parvi redditus tuta.*

Divorce is a spiritual judgment, and therefore is passed in the spiritual court. Under the old law, the woman divorced was to have of her husband a writing, as St Jerom and Josephus testify, to this effect: *I promise, that hereafter I will lay no claim to thee*; which was called a bill of divorce.

Divorce was allowed of in great latitude both among the pagans and Jews. At Rome, barrenness, age, difcase, madness, and banishment, were the ordinary causes of divorce. Spurius Carvilius, between 500 and 600 years after the building of Rome, under the consulship of M. Attilius, and P. Valerius, was the first who put away his wife because she was barren; though Plutarch, in his Roman Questions, maintains, that Domitian was the first who permitted divorce. Justinian afterwards added impotency, a vow of chastity, and the profession of a monastic life, as valid reasons of divorce.

The Roman lawyers distinguish between *repudium* and *divortium*; making the former to be the breaking of a contract or espousal, and the latter separation after matrimony. Romulus enacted a severe law, which suffered not a wife to leave her husband, but gave the man the liberty of turning off his wife, either upon poisoning her children, counterfeiting his private keys, or for the crime of adultery; but if the husband on any other occasion put her away, he ordered one moiety of his estate for the wife, and the other to the goddess Ceres; besides an atonement to the gods of the earth. However, in later times, the women as well as the men might sue a divorce. The common way of divorcing was by sending a bill to the woman, containing the reasons of separation, and the tender of all her goods which she brought with her: and this was called *repudium mittere*; or else it was performed in her presence, and before seven witnesses, and accompanied with the formalities of tearing the writings, refunding the portion, taking away the keys, and turning the woman out of doors.

The Grecian laws concerning divorces were different: The Cretans allowed divorce to any man that was afraid of having too many children. The Spartans seldom divorced their wives; and it was extremely scandalous for a woman to depart from her husband. The Athenians allowed divorce on very small grounds, by a bill, containing the reason of the divorce, and approved, if the party appealed, by the chief magistrate; and women also were allowed to leave their husbands on just occasions. Persons divorcing their wives were obliged to return their portions; otherwise, the Athenian laws obliged them to pay nine oboli a month for alimony. The terms expressing the separation of men and women from each other were different; the men were said *απολυσεν* or *απολυειν*, to dismiss their wives; but wives, *απολυσεν*, to leave their husbands.

“The law of Moses (Mr Paley observes), for reason. VI. Part I.

sons of local expediency, permitted the Jewish husband to put away his wife; but whether for every cause, or for what cause, appears to have been controverted amongst the interpreters of those times. Christ, the precepts of whose religion were calculated for more general use and observation, revokes this permission, as given to the Jews ‘for their hardness of hearts,’ and promulges a law which was thenceforward to confine divorces to the single cause of adultery in the wife: ‘Whoever shall put away his wife, except it be for fornication, and shall marry another, committeth adultery; and who so marieth her which is put away, doth commit adultery.’ Matt. xix. 9.

“Inferior causes may justify the separation of husband and wife, although they will not authorise such a dissolution of the marriage contract as would leave either at liberty to marry again: for it is that liberty in which the danger and mischief of divorces principally consist. The law of this country, in conformity to our Saviour’s injunction, confines the dissolution of the marriage contract to the single case of adultery in the wife; and a divorce even in that case can only be brought about by the operation of an act of parliament, founded upon a previous sentence in the spiritual court, and a verdict against the adulterer at common law: which proceedings taken together compose as complete an investigation of the complaint as a cause can receive. It has lately been proposed to the legislature to annex a clause to these acts, restraining the offending party from marrying with the companion of her crime, who by the course of proceeding is always known and convicted: for there is reason to fear, that adulterous connections are often formed with the prospect of bringing them to this conclusion; at least, when the seducer has once captivated the affection of a married woman, he may avail himself of this tempting argument to subdue her scruples, and complete his victory; and the legislature, as the business is managed at present, assists by its interposition the criminal design of the offenders, and confers a privilege where it ought to inflict a punishment. The proposal deserves an experiment; but something more penal, it is apprehended, would be found necessary to check the progress of this alarming depravity. Whether a law might not be framed, directing the fortune of the adulterers to descend as in case of her natural death; reserving, however, a certain proportion of the produce of it, by way of annuity, for her subsistence (such annuity in no case to exceed a certain sum); and also so far suspending the estate in the hands of the heir, as to preserve the inheritance to any children she might bear to a second marriage, in case there was none to succeed in the place of their mother by the first: whether such a law would not render female virtue in higher life less vincible, as well as the seducers of that virtue less urgent in their suit, I would recommend to the deliberation of those who are willing to attempt the reformation of this important but most incorrigible class of the community. A passion for splendor, for expensive amusements and distinctions, is commonly found in that description of women who would become the subjects of such a law, not less inordinate than their other appetites. A severity of the kind proposed applies immediately to that passion. And there is no room for any complaint of injustice, since the provisions

Divorce.
Paley’s Moral and Political Philosophy, p. 273.

Diuretics
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Dobson.

sions above stated, with others which might be contrived, confine the punishment, so far as it is possible, to the person of the offender; suffering the estate to remain to the heir, or within the family of the ancestor from whom it came, or to attend the appointments of his will.

"Sentences of the ecclesiastical courts, which release the parties *a vinculo matrimonii*, by reason of impuberty, frigidity, consanguinity within the prohibited degrees, prior marriage, or want of the requisite consent of parents or guardians, are not dissolutions of the marriage contract, but judicial declarations that there never was any marriage; such impediment subsisting at the time as rendered the celebration of the marriage rite a mere nullity. And the rite itself contains an exception of these impediments. The man and woman to be married are charged, "if they know any impediment why they may not be lawfully joined together, to confess it;" and assured, "that so many as are coupled together, otherwise than God's word doth allow, are not joined together by God; neither is their matrimony lawful;" all which is intended by way of solemn notice to the parties, that the vow they are about to make will bind their consciences and authorise their cohabitation only upon the supposition that no legal impediment exist."

DIURETICS (from *dia* *ly*, and *ure* *urine*), medicines which provoke a discharge by urine.

Such is water drank plentifully; white wine drank in the morning; alkali salts of all kinds; sea-salt, sal-gemma; nitre, borax, alum, tartar, sal ammoniac, whey, four milk, lemon-juice, &c. Aqueous liquors are generally diuretic especially if mixed with salt, and drank cold. Fermented liquors are the least diuretic of all; and the less so, as they are the fatter. Sharp thin four wines, rhenish, &c. as also acid spirits of vinegar, salt, sulphur, alum, vitriol, &c. asparagus, bitter almonds, smillage, eryngium, eupatorium, fassafra, &c. are all diuretics.

DIURNAL, in astronomy, something relating to day; in opposition to *nocturnal*, which regards the night.

DIVUS, *Divus*, in antiquity, appellations given to men and women who had been deified, or placed in the number of the gods. See **DEIFICATION**, &c.

Hence it is, that on medals struck for the consecration of an emperor or empress, they give them the title of *divus* or *diva*; for example, **DIVUS JULIUS**. **DIVO ANTONINO PIO**. **DIVO PIO**. **DIVO CLAUDIO**. **DIVA FAUSTINA AUG.** &c.

DIZZINESS, in medicine. See **VERTIGO**.

DO, in music, a note of the Italian scale, corresponding to *ut* of the common gamut. See **MUSIC**.

DOBSON (William), an eminent English portrait and history painter, born at London in 1610. He served an apprenticeship with one Peck, a stationer and picture-dealer; and owed his improvement to the copying some pictures of Titian and Van Dyck, whose manner he always retained. He had farther obligations to the latter of these artists; for it is said, that a picture of his painting being exposed at a shop on Snow-hill, Van Dyck passing by was struck with it exceedingly; and inquiring after the author, found him at work in a poor garret. Van Dyck had the generosity to equip him in a manner suitable to his merit.

He presented him to king Charles I. who took him under his protection, kept him with him at Oxford all the time his majesty continued in that city, and not only sat to him several times for his picture, but caused the prince of Wales, prince Rupert, and most of the lords of his court, to do so too. Mr Dobson, however, being somewhat loose and irregular in his way of life, was far from improving the many opportunities he had of making his fortune; and died very poor in 1647, at his house in St Martin's Lane.

DOBUNI, or **DOBUNII**; an ancient people of Britain, who possessed the territory which now forms the counties of Oxford and Gloucester. Both the names of this British nation seem to have been derived from the low situation of a great part of the country which they inhabited: for both *Dunon* and *Dodon* signify "profound" or "low", in the ancient language of Gaul and Britain. The Dobuni are not mentioned among the British nations who resisted the Romans under Julius Cæsar, which was probably owing to the distance of their country from the scene of action; and before the next invasion under Claudius, they had been so much oppressed by their ambitious neighbours the Cattivellauni, that they submitted with pleasure to the Romans, in order to be delivered from that oppression. Cogidunus, who was at that time (as his name imports) prince of the Dobuni, recommended himself successfully to the favour of the emperor Claudius, by his ready submission, and other means, that he was not only continued in the government of his own territories, but had some other states put under his authority. This prince lived so long, and remained so steady a friend and ally to the Romans, that his subjects, being habituated to their obedience in his time, never revolted, nor stood in need of many forts or forces to keep them in subjection. This is certainly the reason that we meet with so few Roman towns and stations in the country anciently inhabited by the Dobuni. The Durocoronovium of Antoninus, and the Corinurum of Ptolemy, are believed by antiquaries to have been the same place, the capital of the Dobuni, and situated at Cirencester, in Gloucestershire, where there are many marks of a Roman station. Clevum or Glevum, in the thirteenth iter of Antoninus, stood where the city of Gloucester now stands; and Abone, in the fourteenth iter, was probably situated at Avinton on the Severn. The country of the Dobuni was comprehended in the Roman province Britannia Prima.

DOCETÆ (from *doceo* to appear), in ecclesiastical history, the followers of Julius Cæsius, one of the Valentinian sect, towards the close of the second century, who revived a notion that had been adopted by a branch of the Gnostics, against whom St John, Ignatius, and Polycarp, had asserted the truth of the incarnation. They believed and taught, as their name imports, that the actions and sufferings of Jesus Christ were not in reality, but only in appearance.

DOCIMASIA, in Greek antiquity, a probation of the magistrates and persons employed in public business at Athens. It was performed publicly in the forum, where they were obliged to give account of themselves and their past life before certain judges. Among several questions proposed to them, we find the following: Whether they had been dutiful to their pa-

rents,

Dobuni
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Docimasia.

Docimastic rents, had served in the wars, and had a competent estate?

Doc.

DOCIMASTIC ART, a name given to the art of essaying by operations in small, the nature and quantity of metallic or other matters which may be obtained from mineral or other compound bodies. See **REFINING** and **METALLURGY**.

DOCIMENUM **MARMOR**, a name given by the ancients to a species of marble of a bright and clear white, much used in large and sumptuous buildings, such as temples and the like. It had its name from *Docimnos*, a city of Phrygia, afterwards called *Synaias*; near which it was dug, and from whence it was sent to Rome. It was accounted little inferior to the Parian in colour, but not capable of so elegant a polish; whence it was less used by the statuarys, or in other smaller works. The emperor Adrian is said to have used this marble in building the temple of Jupiter; and many others of the great works of the Romans are of it.

DOCK, in botany. See **RUMEX**.

Dock, in the manege, is used for a large case of leather, as long as the dock of a horse's tail, which serves it for a cover. The French call the dock *trouffignee*. It is made fast by straps to the crupper, and has leathern thongs that pass between his thighs, and along his flanks to the saddle-straps, in order to keep the tail tight, and to hinder it from whisking about.

Dock, in maritime affairs, a sort of broad and deep trench, formed on the side of a harbour, or on the banks of a river; and commodiously sited either to build ships or receive them to be repaired and *breamed* therein. These forts of docks have generally strong flood-gates to prevent the flux of the tide from entering the dock while the ship is under repair.—There are likewise docks of another kind, called *wet docks*, where a ship can only be cleaned during the recess of the tide, or in the interval between the time when the tide left her dry a-ground and the period when it again reaches her by the return of the flood. Docks of the latter kind are not furnished with the usual flood-gates.

Dock-Yards, certain magazines containing all sorts of naval stores and timber for ship-building. In England, the royal dock-yards are at Chatham, Portsmouth, Plymouth, Deptford, Woolwich, and Sheerness. His majesty's ships and vessels of war are generally moored at these ports during the time of peace; and such as want repairing are taken into the docks, examined, and refitted for service.

The principal dock-yards are governed by a commissioner, resident at the port; who superintends all the matters of the officers, artificers, and labourers, employed in the dock-yard and ordinary. He also controls their payment therein; examines the accounts; contracts, and draws bills on the navy-office to supply the deficiency of stores; and, finally, regulates whatever belongs to the dock-yard, maintaining due order in the respective offices.

These yards are generally supplied from the northern crowns with hemp, pitch, tar, rosin, canvas, oak-plank, and several other species. With regard to the masts, particularly those of the largest size, they are usually imported from New-England.

DOCTOR, a person who has passed all the degrees of a faculty, and is empowered to teach or practise the same: thus we say, doctor in divinity, doctor in physic, doctor of laws.

The establishment of the *doctorate*, such as now in use among us, is ordinarily attributed to Irænerius, who himself drew up the formulary. The first ceremony of this kind was performed at Bologna, in the person of Bulgarus, who began to profess the Roman law, and on that occasion was solemnly promoted to the *doctorate*, i. e. installed *juris utriusque doctor*. But the custom was soon transferred from the faculty of law to that of theology; the first instance whereof was given in the university of Paris, where Peter Lombard and Gilbert de la Portree, the two chief divines of those days, were created doctors in theology, *sacre theologie doctores*.

Spelman takes the title of doctor not to have commenced till after the publication of Lombard's sentences, about the year 1140; and affirms, that such as explained that work to their scholars were the first that had the appellation of doctors. Others go much higher, and hold Bede to have been the first doctor at Cambridge, and John de Beverley at Oxford, which latter died in the year 721. But Spelman will not allow doctor to have been the name of any title or degree in England till the reign of king John, about the year 1207.

To pass doctor in divinity at Oxford, it is necessary the candidate have been four years bachelor of divinity. For doctor of laws, he must have been seven years in the university to commence bachelor of law; five years after which he may be admitted doctor of laws. Otherwise, in three years after taking the degree of master of arts, he may take the degree of bachelor in law; and in four years more, that of LL. D. which same method and time are likewise required to pass the degree of doctor in physic.

At Cambridge, to take the degree of doctor in divinity, it is required the candidate have been seven years bachelor of divinity. Though in several of the colleges the taking of the bachelor of divinity's degree is dispensed with, and they may go out *per saltum*. To commence doctor in laws, the candidate must have been five years bachelor of law, or seven years master of arts. To pass doctor in physic, he must have been bachelor in physic five years, or seven years master of arts. A doctor of the civil law may exercise ecclesiastical jurisdiction, though a layman, stat. 37 Hen. VIII. cap. 17. sect. 4.

Doctor of the Law, a title of honour among the Jews. The investiture, if we may so say, of this order was performed by putting a key and table-book in their hands; which is what some authors imagine our Saviour had in view, Luke xi. 52, when, speaking of the doctors of the law, he says, "Wo unto you doctors of the law, for you have taken away the key of knowledge: you entered not in yourselves, and them that were entering you hindered."

Doctor of the Church, a title given to certain of the fathers whose doctrines and opinions have been the most generally followed and authorized. We usually reckon four doctors of the Greek church, and three of the Latin. The first are St Athanasius, St Basil, St Gregory Nazianzen, and St Chrysostom. The latter are

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Dodd.

St Jerom, St Augustine, and Gregory the Great. In the Roman breviary there is a particular office for the doctors. It only differs from that of the confessors, by the anthem of the Magnificat, and the lessons.

DOCTOR, is also an appellation adjoined to several specific epithets, expressing the merit of some of the schoolmen: thus, Alexander Hales is called the irrefragable doctor; Thomas Aquinas, the angelic doctor; St Bonaventure, the seraphic doctor; John Duns Scotus, the subtle doctor; Raimond Lully, the illuminated doctor; Roger Bacon, the admirable doctor, &c.

DOCTOR, *Διδασκαλος*, in the Greek church, is a particular officer, appointed to interpret part of the scriptures. He who interprets the Gospels, is called *doctor of the Gospels*; he who interprets St Paul's Epistles, *doctor of the Apostle*; he who interprets the Psalms, *doctor of the Psalter*.

DOCTORS-Commons. See COLLEGE of Civilians.

DOCUMENT, in law, some written monument produced in proof of any thing asserted.

DODAR^{IA}, in botany. A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 4th order, *Perfonate*. The calyx is quinquedentate; the under lip of the corolla twice as long as the upper; the capsule bilocular and globose.

DODD (Dr William), an unfortunate English divine, eldest son of the Rev. William Dodd, many years vicar of Bourne in Lincolnshire, was born May 29. 1729. He was sent, at the age of 16, to the university of Cambridge; and admitted, in the year 1745, a fellow of Clare-Hall. In 1749-50 he took the degree of B. A. with great honour, being upon that occasion in the list of wranglers. Leaving the university, he imprudently married a Miss Mary Perkins in 1751, was ordained a deacon the same year, priest in 1753, and soon became a celebrated and popular preacher. His first preferment was the lectureship of West Ham. In 1754 he was also chosen lecturer of St Olave's, Hart-Street; and in 1757 took the degree of M. A. at Cambridge. On the foundation of the Magdalen Hospital in 1758, he was a strenuous supporter of that charity, and soon after became preacher at the chapel of it. By the patronage of Bishop Squire, he in 1763 obtained a prebend of Brecon, and by the interest of some city-friends procured himself to be appointed one of the king's chaplains; soon after which, he had the education of the present earl of Chesterfield committed to his care. In 1766 he went to Cambridge and took the degree of LL. D. At this period, the estimation in which he was held by the world was sufficient to give him expectations of preferment, and hopes of riches and honours; and these he might probably have acquired, had he possessed a common portion of prudence and discretion. But, impatient of his situation, and eager for advancement, he rashly fell upon means which in the end were the occasion of his ruin. On the living of St George, Hanover-Square, becoming vacant, he wrote an anonymous letter to the chancellor's lady, offering 3000 guineas if by her assistance he was promoted to it. This being traced to him, complaint was immediately made to the king, and Dr Dodd was dismissed with disgrace from his office of chaplain. From this period he lived neglected, if not despised;

and his extravagance still continuing, he became involved in difficulties, which tempted him to forge a bond from his late pupil lord Chesterfield, Feb. 4. 1777, for L. 4200, which he actually received; but being detected, he was tried at the Old Bailey, found guilty, and received sentence of death; and, in spite of every application for mercy, was executed at Tyburn, June 27. 1777. Dr Dodd was a voluminous writer, and possessed considerable abilities, with little judgment and much vanity. An accurate list of his various writings is prefixed to his "Thoughts in Prison," ed. 1784.

DODDER, in botany. See CUSCUTA.

DODDRIDGE (Philip), D. D. an eminent Presbyterian minister, was the son of Daniel Doddridge an oil-man in London, where he was born on the 26th of June 1702; and having completed the study of the classics in several schools, was, in 1719, placed under the tuition of the reverend Mr John Jennings, who kept an academy at Kilworth in Leicestershire. He was first settled as a minister at Kilworth, where he preached to a small congregation in an obscure village: but, on Mr Jennings's death, succeeded to the care of his academy; and soon after was chosen minister of a large congregation of Dissenters at Northampton, to which he removed his academy, and where the number of his pupils increased. He instructed his pupils with the freedom and tenderness of a father; and never expected nor desired that they should blindly follow his sentiments, but encouraged them to judge for themselves. He checked any appearance of bigotry and uncharitableness, and endeavoured to cure them by showing what might be said in defence of those principles they disliked. He died at Lisbon, whither he went for the recovery of his health; and his remains were interred in the burying-ground belonging to the British factory there, and a handsome monument was erected to his memory in the meeting-house at Northampton, at the expense of the congregation, on which is an epitaph written by Gilbert West, Esq. He wrote, 1. Free Thoughts on the most probable means of reviving the Dissenting Interest. 2. The Life of Colonel James Gardiner. 3. Sermons on the Education of Children. 4. The Rise and Progress of Religion in the Soul. 5. The Family Expositor, in 6 vols 4to, &c. And since the author's death, a volume of his Hymns have been published, and his Theological Lectures. Several of his works have been translated into Dutch, German, and French.

DODECAGON, in geometry, a regular polygon consisting of twelve equal sides and angles.

DODECAHEDRON, in geometry, one of the platonic bodies, or regular solids, contained under twelve equal and regular pentagons.

DODECANDRIA (from *δωδεκα* twelve, and *ανδρ* a man); the name of the eleventh class in Linnaeus's sexual system, consisting of plants with hermaphrodite flowers, that, according to the title, have twelve stamina or male organs. This class, however, is not limited with respect to the number of stamina. Many genera have sixteen, eighteen, and even nineteen stamina; the essential character seems to be, that, in the class in question, the stamina, however numerous, are inserted into the receptacle: whereas in the next class, icolandra, which

Dodder
||
Dodecan-
dria.Nicol's
Anecdotes of
Boyer.

Dodecas which is as little determined in point of number as the present, they are attached to the inside of the calyx or flower-cup.

The orders in this class, which are six, are founded upon the number of the styles, or female organs. A farabacca, mangostan, florax, purple loofe-strife, wild Syrian rue, and purslane, have only one style; agrimony and heliocarpus have two; burning thorny plant, and balsam rocket, three; *glinus*, five; *illicium*, eight; and house-leek, twelve.

DODECAS, in botany: A genus of the trigynia order, belonging to the dodecandria class of plants. The calyx is half quadrifid, having the corolla above; the corolla quinquefid; the capsule unilocular, conjoined with the calyx.

DODECATHION, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 21st order, *Precie*. The corolla is verticillated and reflexed; the stamina placed in the tube; the capsule unilocular and oblong.

DODO, in ornithology. See **DINUS**.

DODONA, a town of Thesprotia in Epirus, or (according to others) in Thessaly. There was in its neighbourhood a celebrated oracle of Jupiter. The town and temple of the god were first built by Deucalion, after the universal deluge. It was supposed to be the most ancient oracle of all Greece; and according to the traditions of the Egyptians mentioned by Herodotus, it was founded by a dove. Two black doves, as he relates, took their flight from the city of Thebes in Egypt; one of which flew to the temple of Jupiter Ammon, and the other to Dodona, where with an human voice they acquainted the inhabitants of the country that Jupiter had consecrated the ground, which in future would give oracles. The extensive grove which surrounded Jupiter's temple was endowed with the gift of prophecy; and oracles were frequently delivered by the sacred oaks and the doves which inhabited the place. This fabulous tradition of the oracular power of the doves is explained by Herodotus, who observes that some Phenicians carried away two priestesses from Egypt, one of which went to fix her residence at Dodona, where the oracle was established. It may farther be observed, that the fable might have been founded upon the double meaning of the word *TELESTIS*, which signifies *doves* in most parts of Greece, while in the dialect of the Epirots it implies *old women*. In ancient times the oracles were delivered by the murmuring of a neighbouring fountain; but the custom was afterwards changed. Large kettles were suspended in the air near a brazen statue, which held a lamb in its hand. When the wind blew strong, the statue was agitated and struck against one of the kettles, which communicated the motion to all the rest, and raised that clattering and discordant din, which continued for a while, and from which the artifice of the priests drew the predictions. Some suppose that the noise was occasioned by the shaking of the leaves and boughs of an old oak, which the superstition of the people frequently consulted, and from which they pretended to receive oracles. It may be observed with more probability, that the oracles were delivered by the priests, who, by artfully concealing themselves behind the oaks, gave occasion to the super-

stitious multitude to believe that the trees were endowed with the power of prophecy. As the ship *Argo* was built with some of the oaks of the forest of Dodona, there were some beams which gave oracles to the Argonauts, and warned them against the approach of calamity. Within the forest of Dodona there was a stream and a fountain of cool water which had the power of lighting a torch as soon as it touched it. This fountain was totally dry at noon day, and was restored to its full course at midnight, from which time till the following noon it began to decrease, and at the usual hour was again deprived of its waters. The oracles of Dodona were generally delivered by women.

DODONEA, in botany: A genus of the monogynia order belonging to the octandria class of plants. The calyx is tetraphyllous; there is no corolla; the capsule trilocular and inflated; the seeds twofold.

DODONIAN, *Dodonæus*, in antiquity, an epithet given to Jupiter, because he was worshipped in a temple built in the forest of Dodona, where was the most famous, and (it is said) the most ancient, oracle of all Greece. See **DODONA**.

DODONIDES, the priestesses who gave oracles in the temple of Jupiter in Dodona. According to some traditions the temple was originally inhabited by seven daughters of Atlas, who nursed Bacchus. Their names were Ambrosia, Eudora, Pasithoe, Pytho, Plexaure, Coronis, Tyche or Tyche. In the later ages the oracles were always delivered by three old women; which custom was first established when Jupiter enjoyed the company of Dione, whom he permitted to receive divine honour in his temple at Dodona. The Boeotians were the only people of Greece who received their oracles at Dodona from men, for reasons which Strabo, l. 9, fully explains.

DODRANS, in antiquity, three-fourths of the as. See the article **As**.

DODSLEY (Robert), a late eminent bookseller, and ingenious writer, born at Mansfield in Nottinghamshire, in the year 1703. He was not indebted to education for his literary fame, being originally a livery servant; but his natural genius, and early passion for reading, soon elevated him to a superior station. He wrote an elegant little fatirical farce called *The Tey-sloop*, which was acted with applause in 1735, and which recommended him to the patronage of Mr Pope. The following year he produced the *King and Miller of Mansfield*. The profits of these two farces enabled him to commence bookseller, and his own merit procured him eminence in that profession. He wrote some other dramatic pieces, and published a collection of his works in one vol. 8vo, under the modest title of *Trifles*; which was followed by *Public Virtue*, a poem in 4to. Beside what he wrote himself, the public were obliged to him for exerting his judgment in the way of his business; he having collected several volumes of well chosen *Miscellaneous Poems and Fugitive Pieces*, whose brevity would else have endangered their being totally lost to posterity. He died in 1764.

DODWELL (Henry), a very learned controversial writer, born at Dublin, but of English extraction, in 1641. He wrote an incredible number of tracts; but his services were so little acknowledged, that bishop Burnet and others accuse him of doing more hurt than good.

Dodonæa

Dodwell

Doeburg, good to the cause of Christianity, by his indiscreet love of paradoxes and novelties, and thus exposing himself to the scoffs of unbelievers. His pamphlet on the immortality of the soul gave rise to the well known controversy between Mr Collins and Dr Clark on that subject. He died in 1711.

DOESBURG, a town of the united provinces, in the county of Zutphen and province of Guelderland. It is small, but well peopled, and very strong both by art and nature, having the river Yssel on one side, and a morass on the other, and is only to be approached by a narrow neck of land. E. Long. 5. 55. N. Lat. 52. 3.

DOG, in zoology : An animal remarkable for its natural docility, fidelity, and affection for its master ; which qualities mankind are careful to improve for their own advantage. These useful creatures guard our houses, gardens, and cattle, with spirit and vigilance. By their help we are enabled to take not only beasts, but birds ; and to pursue game both over land and through the waters. In some northern countries, they serve to draw sleds, and are also employed to carry burdens. In several parts of Africa, China, and by the West Indian negroes, dogs are eaten, and accounted excellent food. Nay, we have the testimony of Mr Tourtier, that dogs flesh, in taste, exactly resembles mutton *. They were also used as food by the Romans, and long before them by the Greeks, as we learn from several treatises of Hippocrates. In the present times, their skins, dressed with the hair on, are used in muffs, made into a kind of buskins for persons in the gout, and for other purposes. Prepared in another way, they are used for ladies gloves, and the linings of masks, being thought to make the skin peculiarly white and smooth. The French import many of these skins from Scotland, under a small duty. Here, when tanned, they serve for upper leathers for neat pumps. Dogs skins dressed are exported under a small, and imported under a high, duty. The French import from Denmark large quantities of dogs hair, both white and black. The last is esteemed the best, and is worked up in the black list of a particular kind of woollen cloth ; but is not used, as many have supposed, in making of hats, being entirely unfit for this purpose.

With regard to the qualities of dogs, those bred in the island of Britain are justly reckoned superior to the dogs bred in any other country. The swiftness of the greyhound is amazing : as are also the steadiness and perseverance of other hounds and beagles ; the boldness of terriers in unearthing foxes, &c. ; the sagacity of pointers and setting dogs, who are taught a language by signs as intelligible to sportsmen as speech ; and the invincible spirit of a bull-dog, which can be quelled only by death.—All the nations in Europe not only do justice to the superior qualities of the British dogs, but adopt our terms and names, and thankfully receive the creatures as presents.—It is remarkable, however, that almost every kind of British dogs degenerates in foreign countries ; nor is it possible to prevent this degeneracy by any art whatever.

For the natural history of the dog, see **CANIS**.

Choosing of Dogs. In order to choose a dog and bitch for good whelps, take care that the bitch come of a generous kind, be well proportioned, having large ribs and flanks ; and likewise that the dog be of a good

breed and young, for a young dog and an old bitch breed excellent whelps.

The best time for hounds nitches, or bratchets, to be lined in, are the months of January, February, and March. The bitch should be used to a kennel, that she may like it after her whelping, and she ought to be kept warm. Let the whelps be weaned after two months old ; and though it be some difficulty to choose a whelp under the dam that will prove the best of the litter, yet some approve that which is last, and account him to be the best. Others remove the whelps from the kennel, and lay them severally and apart one from the other ; then they watch which of them the bitch first takes and carries into her kennel again, and that they suppose to be the best. Others again imagine that which weighs least when it sucks to be the best : this is certain, that the lighter whelp will prove the swifter. As soon as the bitch has littered, it is proper to choose them you intend to preserve, and drown the rest : keep the black, brown, or of one colour ; for the spotted are not much to be esteemed, though of hounds the spotted are to be valued.

Hounds for chase are to be chosen by their colours. The white, with black ears, and a black spot at the setting on of the tail, are the most principal to compose a kennel of, and of good feed and condition. The black hound, or the black tanned, or the all liver-coloured, or all white : the true talbots are the best for the strongest line ; the grizzled, whether mixed or unmixed, so they be flag-haired, are the best verminers, and a couple of these are proper for a kennel.—In short, take these marks of a good hound : That his head be of a middle proportion, rather long than round ; his nostrils wide, his ears large, his back bowed ; his fillet great, his haunches large, thighs well trussed, ham straight, tail big near the reins, the rest slender ; the leg big, the sole of the foot dry, and in the form of that of a fox, with large claws.

Keeping Dogs in Health.—As pointers and spaniels, when good of their kinds and well broken, are very valuable to a sportsman, it is worth while to take some care to preserve them in health. This very much depends on their diet and lodging : frequent cleaning their kennels, and giving them fresh straw to lie on, is very necessary ; or, in summer-time, deal-shavings, or sand, instead of straw, will check the breeding of fleas. If you rub your dog with chalk, and brush and comb him once or twice a-week, he will thrive much the better ; the chalk will clear his skin from all grime, and he will be the less liable to be mangy. A dog is of a very hot nature : he should therefore never be without clean water by him, that he may drink when he is thirsty. In regard to their food, carrion is by no means proper for them : it must hurt their sense of smelling, on which the excellence of these dogs greatly depends. Barley-meal, the dross of wheat flour, or both mixed together, with broth or skimmed milk, is very proper food. For change, a small quantity of greaves from which the tallow is pressed by the chandlers, mixed with flour, or sheep's feet well baked or boiled, are a very good diet ; and when you indulge them with flesh, it should always be boiled. In the season of hunting your dogs, it is proper to feed them in the evening before, and give them nothing in the morning you intend to take them

out

* See *Am. Hist.*, n^o 90.

Dog. out except a little milk. If you stop for your own refreshment in the day, you should also refresh your dogs with a little bread and milk. It has been already observed that dogs are of a hot constitution; the greatest relief to them in the summer is twitch-grafs, or dog-grafs, which is the same thing. You should therefore plant some of it in a place where you can turn them into every morning: they will feed freely on it to be cured of the sickness they are subject to, and cured of any extraordinary heat of blood: but unless the grafs be of this sort, it will have no effect.

Diseases of Dogs.—1. *Bites and Stings.* If dogs are bitten by any venomous creatures, as snakes, adders, &c. squeeze out the blood, and wash the place with salt and urine; then lay a plaster to it made of calamin, pounded in a mortar, with turpentine and yellow wax, till it come to a scab. If you give your dog some of the juice of calamin to drink in milk, it will be good; or an ounce of treacle dissolved in some sweet wine.

2. *Mange.* Dogs are subject to the mange from being fed too high, and allowed no exercise or an opportunity of refreshing themselves with dog-grafs; or by being starved at home, which will cause them to eat the vilest stuff abroad, such as carrion, or even human excrement; or by want of water, and sometimes by not being kept clean in their kennel, or by foundering and melting in their grease. Either of these will heat the blood to a great degree, which will have a tendency to make them mangy. The cure may be effected by giving stone-brimstone powdered fine, either in milk or mixed up with butter, and rubbing them well every day for a week with an ointment made of some of the brimstone and pork-lard, to which add a small quantity of oil of turpentine.—Or, boil four ounces of quicksilver in two quarts of water to half the quantity; bathe them every day with this water, and let them have some of it to lick till the cure is perfected. Or, a small quantity of trooper's ointment rubbed on the parts on its first appearance will cure it. It will also free lousy puppies from their lice. Or, take two ounces of euphorbium; flour of sulphur, Flanders oil of bays, and soft soap, each four ounces. Anoint and rub your dog with it every other day; give him warm milk, and no water. The cure will be performed in about a week. The following receipt is also said to be efficacious. Take two handfuls of wild cresses, and as much elecampane, and also of the leaves and roots of roerb and forrel, and two pounds of the roots of fodels: boil all these well together in kee and vinegar; strain the decoction, and put into it two pounds of grey soap, and when it is melted, rub the dog with it four or five days successively, and it will cure him.

3. *Poison.* If you suspect your dog to be poisoned with nux vomica (the poison usually employed by the warreners, which causes convulsive fits and soon kills), the most effectual remedy, if immediately applied, is to give him a good deal of common salt; to administer which, you may open his mouth, and put a stick across to prevent the shutting it, whilst you cram his throat full of salt, at the same time holding his mouth upwards; and it will dissolve so that a sufficient quantity will be swallowed to purge and vomit him. When his stomach is sufficiently cleared by a

free passage obtained by stool, give him some warm broth frequently, to prevent his expiring from faintness; and he will recover.

4. *Worms.* Dogs are very frequently troubled with worms; but more particularly whilst they are young. Any thing bitter is so nauseous to these worms, that they are very often voided by taking two or three purges of aloes; or (which is the same thing) Scots pills, four or five being a dose for a large dog: this is to be repeated two or three times in a week. If this do not succeed, you may give him an ounce of powder of tin mixed up with butter, in three doses; which seldom fails to cure. Or of the herb favin, dried and rubbed to powder, give about as much as will lie on a shilling for a dose; which will entirely destroy worms and their feed.

6. *Sore Feet.* A pointer ought not to be hunted oftener than two or three days in a week; and unless you take care of his feet, and give him good lodging as well as proper food, he will not be able to perform that through the season. You should therefore, after a hard day's hunting, wash his feet with warm water and salt; and when dry, wash them with warm broth, or beer and butter, which will heal their soreness, and prevent a settled stiffness from fixing.

7. *Strains, Blows, or small Wounds.* If your dog has received any little wounds by forcing through hedges, or gets any lameness from a blow or strain; bathe the wound or grieved part with salt and cold vinegar (for warming it only evaporates the fine spirit); and when dry, if a wound, you may pour in it a little friar's balsam, which will perform the cure sooner than any method hitherto experienced.

8. *Coughs and Colds.* Dogs are very subject to a cough, with an extraordinary choking, which is thought to arise generally from a cold or some inward disorder; and probably it is often occasioned by their eating of fish-bones. To guard against it, order your servants to throw all such fish-bones where the dog can't get at them. But if the disorder be from a cold, let bleeding be repeated in small quantities, if necessary; but if it be what is called the *distemper* in dogs, and they appear to be very low in spirits, the bleeding is better omitted. Let meat-broth, or milk-broth warmed, be the principal part of his diet, using at the same time the following medicine. Take flour of sulphur, cold drawn linseed oil, and salt-petre, of each an ounce; divide it into four doses, giving him one dose every other day, and let him have plenty of clean straw to lie on; or one spoonful of honey daily.

Dog-Madness. Of this there are no less than seven sorts common among dogs. The chief causes are, high-feeding, want of exercise, fulness of blood, and coliciveness. As for the two first, you must observe when you hunt them, that they should be better fed than when they rest; and let them be neither too fat nor too lean; but, of the two, rather fat than lean; by which means they will not only be preserved from madness but also from the mange and scab: which diseases they will be subject to for want of air, water, or exercise; but if you have but the knowledge to keep them in an even temper, they may live long, and continue sound. As for water, they should be left to their own pleasure; but for exercise and diet, it must be ordered according to discretion, observing a medi-

Dog.
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um. Give them once a week, especially in the heat of the year, five or six spoonfuls of salad oil, which will cleanse them : at other times, the quantity of a hazelnut of mithridate is an excellent thing to prevent distempers. It is also very good to bleed them under the tongue, and behind the ears.

The symptoms of madnefs are many and easily discerned. When any dog separates himself contrary to his former use, becomes melancholy or droops his head, forbears eating, and as he runs snatches at every thing; if he often looks upwards, and his stern at his setting on be a little erect, and the rest hanging down; if his eyes be red, his breath strong, his voice hoarse, and he drivels and-foams at the mouth; you may be assured he has this distemper.

The seven sorts of madnefs are as follow; of which the two first are incurable. 1. The hot burning madnefs. 2. The running madnefs. The animals labouring under these are peculiarly dangerous; for all things they bite and draw blood from will have the same distemper; and they generally seize on all they meet with, but chiefly on dogs: their pain is so great it soon kills them.—The five curable madnefs are,

3. *Sleeping madnefs*, so called from the dog's great drowiness, and almost continual sleeping. This is caused by the little worms that breed in the mouth of the stomach, from corrupt humours, vapours, and fumes which ascend to the head: for cure of which, take six ounces of the juice of wormwood, two ounces of the powder of hartshorn burnt, and two drams of agaric; mix all these together in a little white-wine, and give it the dog to drink in a drenching horn.

4. *Dumb madnefs*, lies also in the blood, and causes the dog not to feed, but to hold his mouth always wide open, frequently putting his feet to his mouth, as if he had a bone in his throat: to cure this, take the juice of black hellebore, the juice of *spatula putrida*, and of rue, of each four ounces; strain them well, and put thereto two drams of unprepared scammony; and being mixed well together, put it down the dog's throat with a drenching horn, keeping his head up for some time, lest he cast it out again; then bleed him in the mouth, by cutting two or three veins in his gums.

It is said, that about eight drams of the juice of an herb called *hartshorn*, or *dog's tooth*, being given to the dog, cures all sorts of madnefs.

5. *Lank madnefs*, is so called by reason of the dog's leanness and pining away. For cure give them a purge as before directed, and also bleed them: but some say there is no cure for it.

6. *Rheumatic or slaving madnefs*, occasions the dog's head to swell, his eyes to look yellow, and he will be always slaving and driveling at the mouth. To cure which, take four ounces of the powder of the roots of polipody of the oak, six ounces of the juice of fennel-roots, with the like quantity of the roots of milletoe, and four ounces of the juice of ivy: boil all these together in white-wine, and give it to the dog as hot as he can take it, in a drenching horn.

7. *Falling madnefs*, is so termed because it lies in the dog's head, and makes him reel as he goes, and to fall down. For the cure, take four ounces of the juice of briony, and the same quantity of the juice of peony,

N^o 102.

with four drams of flavelace pulverized; mix these together, and give it the dog in a drenching horn; also let him blood in the ears, and in the two veins that come down his shoulders; and indeed bleeding is necessary for all sorts of madnefs in dogs.

When a dog happens to be bit by a mad one, there is nothing better than their licking the place with their own tongues, if they can reach it; if not, then let it be washed with butter and vinegar, made luke-warm, and let it afterwards be anointed with Venice turpentine; but, above all, take the juice of the stalks of strong tobacco boiled in water, and bathe the place therewith; also wash him in sea-water, or water artificially made salt: give him likewise a little mithridate inwardly in two or three spoonfuls of sack; and so keep him apart; and if you find him after some time still to droop, the best way is to hang him.

Some have asserted their having cured several creatures that have been bit by mad dogs, with only giving them the middle yellow bark of buckthorn; which must be boiled in ale for a horse or cow, and in milk for a dog; but that it must be boiled till it is as bitter as you can take it.

As to the preventive of worming dogs, see WORMING.

Dog-Days. See CANICULA.

Dog-Fish. In ichthyology. See SQUALUS.

Dogs-Bane. See APOCYNUM.

Dog-Wood Tree. See PISCIDIA.

DOGE, the chief magistrate in the republics of Venice and Genoa.

The word properly signifies *duke*, being formed from the Latin *dux*; as *dogate*, and *dogado*, from *ducatus*, "duchy."

The dogate, or office and dignity of doge, is elective; at Venice, the doge is elected for life; at Genoa, only for two years; he is addressed under the title of *Serenity*, which among the Venetians is superior to that of highness.

The doge is the chief of the council, and the mouth of the republic; yet the Venetians do not go into mourning at his death, as not being their sovereign, but only their first minister. In effect, the doge of Venice is no more than the phantom or shadow of the majesty of a prince; all the authority being reserved to the republic. He only lends his name to the senate; the power is diffused throughout the whole body, though the answers be all made in the name of the doge. If he gives any answers on his own account, they must be very cautiously exprest, and in general terms, otherwise he is sure to meet with a reprimand. So that it is absolutely necessary he be of an easy and pliable disposition.

Anciently the doges were sovereigns; but things are much altered; and at present, all the prerogatives reserved to the quality of doges, are these which follow: he gives audience to ambassadors; but does not give them any answer from himself, in matters of any importance; only he is allowed to answer according to his own pleasure, to the compliments they make to the signory; such answers being of no consequence. The doge, as being first magistrate, is head of all the councils; and the credentials which the senate furnishes its ministers in foreign courts, are written in his

name;

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tists.

name; and yet he does not sign them; but a secretary of state signs them, and seals them with the arms of the republic. The ambassadors direct their dispatches to the doge; and yet he may not open them but in presence of the counsellors. The money is struck in the doge's name, but not with his stamp or arms. All the magistrates rise, and salute the doge when he comes into council; and the doge rises to none but foreign ambassadors.

The doge nominates to all the benefices in the church of St Mark; he is protector of the monastery delle Vergine; and bestows certain petty offices of ulcers of the household, called *Commanders of the Palace*. His family is not under the jurisdiction of the master of the ceremonies; and his children may have staff-officers, and gondoliers in livery.

His grandeur, at the same time, is tempered with a variety of circumstances, which render it burdensome. He may not go out of Venice without leave of the council; and if he does go out, he is liable to receive affronts, without being intitled to demand satisfaction; and, if any disorder should happen where he was, it belongs not to him, but to the podesta, as being invested with the public authority, to compose it.

The children and brothers of the doge are excluded from all the chief offices of state. They may not receive any benefice from the court of Rome; but are allowed to accept of the cardinalate, as being no benefice, nor including any jurisdiction. The doge may not divest himself of his dignity, for his ease; and after his death, his conduct is examined by three inquisitors and five correctors, who sift it with great severity.

DOGGER, a Dutch fishing vessel navigated in the German Ocean. It is generally employed in the herring fishery; being equipped with two masts, viz. a main-mast and a mizen-mast, and somewhat resembling a ketch. See the Plates at the article *SHIP*.

DOGGERS, in the English alum works, a name given by the workmen to a sort of stone found in the same mines with the true alum rock, and containing some alum, though not near so much as the right kind. The county of York, which abounds greatly with the true alum rock, affords also a very considerable quantity of these doggers; and in some places they approach so much to the nature of the true rock, that they are wrought to advantage.

DOGMA, a principle, maxim, tenet, or settled opinion, particularly with regard to matters of faith and philosophy.

DOGMATICAL, something belonging to a doctrine or opinion. A dogmatical philosopher is one who asserts things positively; in opposition to a sceptic, who doubts of every thing.

DOGMATISTS, a sect of ancient physicians, of which Hippocrates was the first author. They are also called *logicians*, from their using the rules of logic in subjects of their profession. They laid down definitions and divisions; reducing diseases to certain genera, and those genera to species, and furnishing remedies for them all; supposing principles, drawing conclusions, and applying those principles and conclusions to particular diseases under consideration: in which sense, the dogmatists stand contradistinguished from em-

piries and methodists. They reject all medicinal virtues that they think not reducible to manifest qualities: but Galen hath long ago observed of such men, that they must either deny plain matter of fact, or assign but very poor reasons and causes of many effects they pretend to explain.

DOLCE (Carlo, or Carlino), a celebrated history and portrait painter, was born at Florence in 1616, and was the disciple of Vignali. This great master was particularly fond of representing pious subjects, though he sometimes painted portraits; and his works are easily distinguished by the peculiar delicacy with which he perfected all his compositions, by a pleasing tint of colour, and by a judicious management of the chiaro scuro. His performance was remarkably flow; and it is reported that his brain was fatally affected by seeing Luca Jordana dispatch more business in four or five hours than he could have done in as many months. He died in 1686.

DOLE, in the Saxon and British tongue, signified a part or portion, most commonly of a meadow, where several persons have shares. It also still signifies a distribution or dealing of alms, or a liberal gift made by a great man to the people.

DOLE, in Scots law, signifies a malevolent intention. It is essential in every crime, that it be committed intentionally, or by an act of the will: hence the rule, *Crimen dolo contrahitur*.

DOLICHOS, in botany: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceae*. The basis of the vexillum has two callous knobs, oblong, parallel, and compressing the ala below. There are 25 species; the most remarkable of which are the following.

1. The lablab, with a winding stalk, is a native of warm climates, where it is frequently cultivated for the table. Mr Hasselquist informs us, that it is cultivated in the Egyptian gardens, but is not a native of that country. The Egyptians make pleasant arbours with it in their houses and gardens, by supporting the stem and leading it where they think proper. They not only support it with sticks and wood, but tie it with cords; by which means the leaves form an excellent covering, and an agreeable shade.

2. The soja is a native of Japan, where it is termed *daisio*; and, from its excellence, *mame*; that is, "the legumen or pod," by way of eminence. It grows with an erect, slender, and hairy stalk, to the height of about four feet. The leaves are like those of the garden kidney-bean*. The flowers are of a bluish white, and pro-

duced from the bosom of the leaves, and succeeded by brittly hanging pods resembling those of the yellow lupine, which commonly contain two, sometimes three, large white seeds. There is a variety of this kind, with a small black fruit, which is used in medicine. Kempter affirms, that the seeds of this when pounded and taken inwardly give relief in the asthma. This legumen is doubly useful in the Japanese kitchens. It serves for the preparation of a substance named *miso*, that is used as butter; and likewise a pickle celebrated among them under the name of *sojia* or *soy*. To make the first, they take a measure of mame, or the beans produced by the plant: after boiling them for a considerable time in water, and to a proper degree of softness,

Dole
Dolichos.

* See Plate
solus.

Dolichos

they beat or bray them into a softish pulse; incorporating with it, by means of repeated braying, a large quantity of common salt, four measures in summer, in winter three. The less salt that is added, the substance is more palatable; but what it gains in point of taste, it loses in durability. They then add to this mixture a certain preparation of rice, to which they give the name of *koos*; and having formed the whole into a compoist, remove it into a wooden vessel which had lately contained their common ale or beverage named *sacki*. In about two months it is fit for use. The *koos* gives it a grateful taste; and the preparing of it, like the polenta of the Germans, requires the skilful hand of an experienced maiter. For this reason there are certain people who make it their sole business to prepare the *koos*, and who sell it ready made for the purpose of making miso: a substance which cannot fail to be greatly valued in those countries where butter from the milk of animals is unknown. To make *sooju* or *soy*, they take equal quantities of the same beans boiled to a certain degree of softness; of muggi, that is corn, whether barley or wheat, roughly ground; and of common salt. Having properly mixed the beans with the pounded corn, they cover up the mixture, and keep it for a day and a night in a warm place, in order to ferment; then putting the mass into a pot, they cover it with the salt, pouring over the whole two measures and a half of water. This compound substance they carefully stir at least once a-day, if twice or thrice the better, for two or three months: at the end of which time, they filtrate and express the mass, preferring the liquor in wooden vessels. The older it is, the better and the clearer; and if made of wheat instead of barley, greatly blacker. The first liquor being removed, they again pour water upon the remaining mass; which, after stirring for some days, as before, they express a second time, and thus obtain an inferior sort of *soy*.

3. The pruriens, or cow-itch, is also a native of warm climates. It hath a fibrous root, and an herbaceous climbing stalk, which is naked, dividing into a great number of branches; and rises to a great height when properly supported. The leaves are alternate and tri-lobate, rising from the stem and branches about 12 inches distant from each other. The footstalk is cylindrical, from 6 to 14 inches long. From the axilla of the leaf descends a pendulous solitary spike, from 6 to 14 inches long, covered with long blood-coloured papilionaceous flowers, rising by threes in a double alternate manner from small fleshy protuberances, each of which is a short pedunculus of three flowers. These are succeeded by leguminous, coriaceous pods, four or five inches long, crooked like an *Italic f*; densely covered with sharp hairs, which penetrate the skin, and cause great itching. This will grow in any soil in those countries where it is a native: but is generally eradicated from all cultivated grounds; because the hairs from the pods fly with the winds, and torment every animal they happen to touch. If it was not for this mischievous quality, the beauty of its flowers would intitle it to a place in the best gardens. It flowers in the cool months, from September to March, according to the situation.—The spiculae, or sharp-hairs, of this plant, have been long used in South America in cases of worms; and have of late been frequently employed

in Britain. The spiculae of one pod mixed with syrup or molasses, and taken in the morning fasting, is a dose for an adult. The worms are said to appear with the second or third dose; and by means of a purge in some cases the stools are said to have consisted almost entirely of worms; and in cases of lumbrici, it is said to produce a safe and effectual cure. Those who have used it most, particularly Dr Bancroft and Dr Cochran, affirm that they have never seen any inconvenience resulting from the internal use of it, notwithstanding the great uneasiness it occasions on the slightest touch to any part of the surface.

DOLLAR, or DALLER, a silver coin, nearly of the value of the Spanish piece of eight or French crown.

Dollars are coined in different parts of Germany and Holland; and have their diminutions, as semi-dollars, quarter dollars, &c. See *MONEY-Table*.

They are not all of the same fineness nor weight. The Dutch dollars are the most frequent. In the Levant they are called *aflaini*, from the impression of a lion thereon.

DOLPHIN, in ichthyology. See DELPHINUS.

DOLPHIN of the Mast, a peculiar kind of wreath, formed of plaited cordage, to be fastened occasionally round the masts, as a support to the puddening, whose use is to sustain the weight of the fore and main yards in case the rigging or chains by which those yards are suspended should be shot away in the time of battle; a circumstance which might render their falls useless at a season when their assistance is extremely necessary. See the article PUDDENING.

DOM, or DOS, a title of honour, invented and chiefly used by the Spaniards, signifying *for* or *lord*.

This title, it seems, was first given to Pelayo, in the beginning of the eighth century. In Portugal no person can assume the title of *don* without the permission of the king, since it is looked upon as a mark of honour and nobility. In France it is sometimes used among the religious. It is an abridgment of *dominus*, from *dominus*.

Dom and Sany, in old charters, signifies full property and jurisdiction.

DOMAIN, the inheritance, estate, or possession of any one. See DEMESNE.

DOMAT (John), a celebrated French lawyer born in 1625, who observing the confused state of the laws, digested them in 4 vols 4to, under the title of *The Civil Laws in their natural order*: for which undertaking, Louis XIV. settled on him a pension of 2000 livres. Domat was intimate with the famous Pascal, who left him his private papers at his death: he himself died in 1696.

DOMED, in architecture, a spherical roof, or a roof of a spherical form, raised over the middle of a building, as a church, hall, pavilion, vestibule, stair-case, &c. by way of crowning.

DOMED, in chemistry, the upper part of furnaces, particularly portable ones. It has the figure of a hollow hemisphere or small dome. Its use is to form a space in the upper part of the furnace, the air of which is continually expelled by the fire: hence the current of air is considerably increased, which is obliged to enter by the ash-hole, and to pass through the fire, to supply the place of the air driven from the dome. The

Dollar

Dome.

form

Dome
li
omef'ay form of this piece renders it proper to reflect or reverberate a part of the flame upon the matters which are in the furnace, which has occasioned this kind of furnace to be called a *reverberating* one. See FURNACE.

DOMÉ, or *Doom*, signifies judgment, sentence, or decree. The homagers oath in the black book of Hereford ends thus: "So help me God at his holy *dome*, and by my trowthe."

DOMENICCHINO, a famous Italian painter, born of a good family at Bologna in 1581. He was at first a disciple of Calvart the Fleming, but soon quitted his school for that of the Caraccis. He always applied himself to his work with much study and thoughtfulness; and never offered to touch his pencil but when he found a proper kind of enthusiasm upon him. His great skill in architecture also procured him the appointment of chief architect of the apostolical palace from Pope Gregory XV.; nor was he without a theoretical knowledge in music. He died in 1641.

DOMESDAY, or DOOMSDAY, BOOK, a most ancient record, made in the time of William I. furnished the *Conqueror*, and containing a survey of all the lands of England. It consists of two volumes, a greater and a less. The first is a large folio, written on 382 double pages of vellum, in a small but plain character; each page having a double column. Some of the capital letters and principal passages are touched with red ink; and some have strokes of red ink run cross them, as if scratched out. This volume contains the description of 31 counties. The other volume is in quarto, written upon 450 double pages of vellum, but in a single column, and in a large but very fair character. It contains the counties of Essex, Norfolk, Suffolk, part of the county of Rutland included in that of Northampton, and part of Lancashire in the counties of York and Chester.

This work, according to the red book in the exchequer, was begun by order of William the Conqueror, with the advice of his parliament, in the year of our Lord 1080, and completed in the year 1086. The reason given for taking this survey, as assigned by several ancient records and historians, was, that every man should be satisfied with his own right, and not usurp with impunity what belonged to another. But, besides this, it is said by others, that now all those who possessed landed estates became vassals to the king, and paid him so much money by way of fee or homage in proportion to the lands they held. This appears very probable, as there was at that time extant a general survey of the whole kingdom, made by order of king Alfred.

For the execution of the survey recorded in domesday book, commissioners were sent into every county and shire; and juries summoned in each hundred, out of all orders of freemen, from barons down to the lowest farmers. These commissioners were to be informed by the inhabitants, upon oath, of the name of each manor, and that of its owner; also by whom it was held in the time of Edward the Confessor; the number of hides; the quantity of wood, of pasture, and of meadow-land; how many ploughs were in the demesne, and how many in the tenanted part of it; how many mills, how many fish-ponds or fisheries belonged to it; with the value of the whole together in the time of king Edward, as well as when granted by king Wil-

liam, and at the time of this survey; also whether it was capable of improvement, or of being advanced in its value: they were likewise directed to return the tenants of every degree, the quantity of lands then and formerly held by each of them, what was the number of villains or slaves, and also the number and kinds of their cattle and live stock. These inquiries being first methodized in the county, were afterwards sent up to the king's exchequer.

This survey, at the time it was made, gave great offence to the people; and occasioned a jealousy that it was intended for some new imposition. But notwithstanding all the precaution taken by the conqueror to have this survey faithfully and impartially executed, it appears from indisputable authority, that a false return was given in by some of the commissioners; and that, as it is said, out of a pious motive. This was particularly the case with the abbey of Croyland in Lincolnshire, the possessions of which were greatly undervalued both with regard to quantity and value. Perhaps more of these pious frauds were discovered, as it is said Ralph Flambard, minister to William Rufus, proposed the making a fresh and more vigorous inquiry; but this was never executed.

Notwithstanding this proof of its falsehood in some instances, which must throw a suspicion on all others, the authority of domesday-book was never permitted to be called in question; and always, when it hath been necessary to distinguish whether lands were held in ancient demesne, or in any other manner, recourse was had to domesday-book, and to that only, to determine the doubt. From this definitive authority, from which, as from the sentence pronounced at *domesday*, or the day of judgment, there could be no appeal, the name of the book is said to have been derived. But Stowe assigns another reason for this appellation; namely, that domesday-book is a corruption of *domus Dei* book; a title given it because heretofore deposited in the king's treasury, in a place of the church of Westminster or Winchester, called *domus Dei*. From the great care formerly taken for the preservation of this survey, we may learn the estimation in which its importance was held. The dialogue of Scaccarius says, "*Liber ille (domesday) sigilli regis comes est individuum in thesauro.*" Until lately it has been kept under three different locks and keys; one in the custody of the treasurer, and the others in that of the two chamberlains of the exchequer. It is now deposited in the chapter-house at Westminster, where it may be consulted on paying to the proper officers a fee of 6s. 8d. for a search, and fourpence per line for a transcript.

Besides the two volumes above mentioned, there is also a third made by order of the same king; and which differs from the others in form more than matter. There is also a fourth called *domesday*, which is kept in the exchequer; which, though a very large volume, is only an abridgement of the others. In the remembrancer's office in the exchequer is kept a fifth book, likewise called *domesday*, which is the same with the fourth book already mentioned. King Alfred had a roll which he called *domesday*; and the domesday-book made by William the Conqueror referred to the time of Edward the Confessor, as that of king Alfred did to the time of Ethelred. The fourth book of domesday having many pictures and gilt letters in the begin-

Domestic. ning relating to the time of king Edward the Confessor, this had led some into a false opinion that *domestic*-day-book was composed in the reign of king Edward.

DOMESTIC, any man who acts under another, serving to compose his family; in which he lives, or is supposed to live, as a chaplain, secretary, &c. Some times domestic is applied to the wife and children; but very seldom to servants, such as footmen, lacques, porters, &c.

DOMESTIC, *adj.* is sometimes opposed to foreign. Thus "*domestic* occurrences" signify those events which happen in our own country, in contradistinction to those of which we receive intelligence from abroad.

In its more usual acceptance, the term implies something peculiar to *home* or *household*. Thus we speak of *domestic* happiness or pleasures: meaning the pleasures enjoyed in the bosom of one's family; in opposition to those found in the bustle of public life, or delusively sought in the haunts of dissipation.

The solace of domestic enjoyments has been coveted by the wisest and greatest of men. Senators and heroes have shut out the acclamations of an applauding world, to enjoy the prattling of their little ones, and to partake the endearments of family conversation. They knew that even their best friends, in the common intercourse of life, were in some degree actuated by interested motives in displaying their affection; that many of their followers applauded them in hopes of reward; and that the giddy multitude, however zealous, were not always judicious in their approbation. But the attentions paid them at their fire-side, the smiles which exhilarated their own table, were the genuine result of undisssembled love.

To pursue the observations of an elegant essayist: "The nursery has often alleviated the fatigues of the bar and the senate-house. Nothing contributes more to raise the gently pleasing emotions, than the view of infant innocence, enjoying the raptures of a game at play. All the sentiments of uncontrolled nature display themselves to the view, and furnish matter for agreeable reflection to the mind of the philosophical observer. To partake with children in their little pleasures, is by no means unmanly. It is one of the purest sources of mirth. It has an influence in amending the heart, which necessarily takes a tincture from the company that surrounds us. Innocence as well as guilt is communicated and increased by the contagion of example. And the great Author of evangelical philosophy has taught us to emulate the simplicity of the infantine age. He seems indeed himself to have been delighted with young children, and found in them, what he in vain sought among those who judged themselves their superiors, unpolluted purity of heart.

"Among the great variety of pictures which the vivid imagination of Homer has displayed throughout the *Iliad*, there is not one more pleasing than the family piece, which represents the parting interview between Hector and Andromache. It deeply interests the heart, while it delights the imagination. The hero ceases to be terrible, that he may become amiable. We admire him while he stands completely armed in the field of battle; but we love him more while he is taking off his helmet, that he may not frighten his little boy with his nodding plumes. We are refreshed with the tender scene of domestic love, while all

around breathes rage and discord. We are pleased to see the arm, which is shortly to deal death and destruction among a host of foes, employed in caressing an infant son with the embraces of paternal love. A professed critic would attribute the pleasing effect entirely to contrast; but the heart has declared, previously to the inquiries of criticism, that it is chiefly derived from the satisfaction which we naturally take in beholding great characters engaged in tender and amiable employments.

"But after all that is said of the purity and the solidity of domestic pleasures, they unfortunately appear, to a great part of mankind, insipid, unmanly, and capable of satisfying none but the weak, the spiritless, the inexperienced, and the effeminate. The pretenders to wit and modern philosophy are often found to renounce the received opinions of prudent conduct; and, while they affect a superior liberality, to regulate their lives by the most selfish principles. Whatever appears to have little tendency to promote personal pleasure and advantage, they leave to be performed by those simple individuals, who are dull enough, as they say, to pursue the journey of life by the straight road of common sense. It is true, they will allow, that the world must be replenished by a perpetual succession; and it is no less true, that an offspring, once introduced into the world, requires all the care of painful attention. But let the talk be reserved for meaner spirits. If the passions can be gratified without the painful consequences of supporting a family, they eagerly seize the indulgence. But the toil of education they leave to those whom they deem fools enough to take a pleasure in it. There will always be a sufficient number, say they, whose folly will lead them, for the sake of a silly passion called virtuous love, to engage in a life of perpetual anxiety. The fool's paradise, they add, with desision, will never be deserted.

"Presumptuous as are all such pretenders to newly-invented systems of life and conduct, it is not to be supposed they will think themselves superior to Cicero. Yet Cicero, with all his liberality of mind, felt the tenderness of conjugal and paternal attachment, and acknowledged that, at one time, he received no satisfaction in any company but that of his wife, his little daughter, and, to use his own epithet, his *honest* young Cicero. The great Sir Thomas More, whom nobody will suspect of narrowness of mind, who by a very singular treatise evinced that he was capable of thinking and of choosing for himself, has left it on record that he devoted a great share of his time, from the united motives of duty and delight, to the amusement of his children.

"It will be objected by those who pretend to have formed their ideas of life from actual observation, that domestic happiness, however pleasing in description, like many a poetic dream, is but an alluring picture, designed by a good heart, and painted in glowing colours by a lively fancy. The constant company, they urge, even of those we love, occasions an insipidity. Insipidity grows into disgust. Disgust, long continued, sours the temper. Peevishness is the natural consequence. The domestic circle becomes the scene of dispute. Mutual antipathy is ingenious in devising mutual torment. Sullen silence or malignant remarks fill up every hour, till the arrival of a stranger causes a temporary

Domestic
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Dominant.

porary restraint, and excites that good humour which ought to be displayed among those whom the bonds of affection and blood have already united.

"Experience, indeed, proves that these remarks are sometimes verified. But that there is much domestic misery is no argument that there is no domestic happiness, or that the evil may not be removed. Natural stupidity, natural ill temper, acquired ill habits, want of education, illiberal manners, and a neglect of the common rules of discretion, will render every species of intercourse disagreeable. When those are united by connubial ties who were separated by natural and inherent diversity, no wonder if that degree of happiness which can only result from a proper union, is unknown. In the forced alliance, which the poet of *Venusium* mentions, of the serpent with the dove, of the tyger with the lamb, there can be no love. When we expatiate on the happiness of the domestic groupe, we presuppose that all who compose it are originally assimilated by affection, and are still kept in union by discreet friendship. Where this is not the case, the censure must fall on the discordant disposition of the parties, and not on the essential nature of family intercourse.

"To form, under the direction of prudence, and by the impulse of virtuous love, an early conjugal attachment, is one of the best securities of virtue, as well as the most probable means of happiness. The duties, which are powerfully called forth by the relations of husband and father, are of that tender kind which inspires goodness and humanity. He who beholds a woman whom he loves, and an helpless infant, looking up to him for support, will not easily be induced to indulge in unbecoming extravagance, or devote himself to indolence. He who has a rising family to introduce into a vicious world, will be cautious of setting a bad example, the contagion of which, when it proceeds from parental authority, must be irresistibly malignant. Thus many who, in their individual and unconnected state, would probably have spent a life not only useless to others, but profligate and careless in itself, have become valuable members of the community, and have arrived at a degree of moral improvement, to which they would not otherwise have attained.

"The contempt in which domestic pleasures have in modern times been held, is a mark of profligacy. It is also a proof of a prevailing ignorance of real enjoyment. It argues a defect in taste and judgment as well as in morals. For the general voice of the experienced has in all ages declared, that the truest happiness is to be found at home."

DOMICILE, in Scots law, is the dwelling-place where a person lives with an intention to remain.

DOMIFYING, in astrology, the dividing or distributing the heavens into 12 houses, in order to erect a theme, or horoscope, by means of six great circles, called *circles of position*.

There are various ways of domifying: that of *Regiomontanus*, which is the most common, makes the circles of position pass through the intersections of the meridian and the horizon: others make them pass through the poles of the zodiac.

DOMINANT (from the Latin word *dominari* "to

rule or govern"), among musicians, is used either as an adjective or substantive; but these different acceptations are far from being indiscriminate. In both senses it is explained by *Roussseau* as follows.

The *dominant* or sensible chord is that which is practised upon the dominant of the tone, and which introduces a perfect cadence. Every perfect major chord becomes a *dominant* chord, as soon as the seventh minor is added to it.

Dominant (subst.). Of the three notes essential to the tone, it is that which is a fifth from the tonic. The tonic and the *dominant* fix the tone; in it they are each of them the fundamental sound of a particular chord; whereas the mediant, which constitutes the mode, has no chord peculiar to itself, and only makes a part of the chord of the tonic.

Mr *Raneau* gives the name of *dominant* in general to every note which carries a chord of the seventh, and distinguishes that which carries the sensible chord by the name of a *tonick dominant*; but, on account of the length of the word, this addition to the name has not been adopted by artists: they continue simply to call that note a *dominant* which is a fifth from the tonic; and they do not call the other notes which carry a chord of the seventh *dominants*, but *fundamentals*; which is sufficient to render their meaning plain, and prevents confusion.

A *dominant*, in that species of church-music which is called *plain-chant*, is that note which is most frequently repeated or beaten, in whatever degree it may be from the tonic. In this species of music there are *dominants* and *tonicks*, but no mediant.

DOMINATION, or **DOMINION**, in theology, the fourth order of angels or blessed spirits in the hierarchy, reckoning from the seraphim. See **ANGEL**.

DOMINGO, or **St DOMINGO**, the capital of the island of Hispaniola in the West Indies, is seated in that part belonging to the Spaniards on the south side of the island, and has a commodious harbour. The town is built in the Spanish manner, with a great square in the middle of it; about which are the cathedral and other public buildings. From this square run the principal streets, in a direct line, they being crossed by others at right angles, so that the form of the town is almost square. The country on the north and east side is pleasant and fruitful; and there is a large navigable river on the west, with the ocean on the south. It is the see of an archbishop, an ancient royal audience, and the seat of the governor. It has several fine churches and monasteries; and is so well fortified, that a fleet and army sent by Oliver Cromwell in 1654 could not take it. The inhabitants are Spaniards, Negroes, Mulattoes, Melitices, and Albatraeces; of whom about a sixth part may be Spaniards. It had formerly about 2000 houses, but it is much declined of late years. The river on which it is seated is called *Ozama*. W. Long. 69. 30. N. Lat. 18. 25.

DOMINIC (de Gulman), founder of the Dominican order of monks, was born at Calaroga in Old Castile, 1170. He preached with great fury against the Albigenses, when Pope Innocent III. made a crusade against that unhappy people; and was inquisitor in Languedoc, where he founded his order, and got it confirmed by the Lateran council in 1215. He died

Dominant
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Dominic.

Dominica
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Dominical.

at Bologna in 1221, and was afterwards canonized. The dominican order has produced many illustrious men. See DOMINICANS.

DOMINICA, one of the Caribbee islands in the West Indies, about 39 miles long and 13 broad, situated between 61° and 62° W. Long. and between 15° and 16° of N. Lat. This island formerly belonged to the French, but was ceded to Britain by the treaty in 1763. It is very advantageous to the latter, as being situated between the French islands of Gaudaloupe and Martinico, so that it is equally alarming to both; and its safe and commodious roads enable the British privateers to intercept, without risk, the navigation of France in her colonies, whenever a war happens between the two nations.

This island was reduced, in the year 1778, by the French, under the marquis de Bouille, governor of Martinico. At that time the island, though very well fortified, had been unaccountably neglected by the British government, in such a manner as to be almost entirely destitute of a garrison. The French commander therefore, who made a descent with 2000 men, found only 100 regular forces and a few companies of militia to oppose him. All resistance therefore being vain, the only thing the garrison could do was to procure as favourable terms of capitulation as possible. These were granted with such readiness as did great honour to the character of this officer; the inhabitants experiencing no kind of change except that of transferring their obedience from Britain to France, being left unmolested in the enjoyment of all their rights both civil and religious. The capitulation was strictly observed by the Marquis; no plunder or irregularity being allowed, and a pecuniary gratification being distributed among the soldiers and volunteers who accompanied him in the expedition. An hundred and sixty-four pieces of excellent cannon, and twenty-four brass mortars, besides a large quantity of military stores, were found in the place; inasmuch that the French themselves expressed their surprise at finding so few hands to make use of them. The Marquis, however, took care to supply this defect, by leaving a garrison of 1500 of the best men he had with him. It was restored to Britain at the conclusion of the peace in 1783.

La DOMINICA, one of the MARQUESAS Islands in the South-Sea.

DOMINICAL LETTER, properly called *Sunday-Letter*, one of the seven letters A B C D E F G, used in almanacks, ephemerides, &c. to denote the Sundays throughout the year. See CHRONOLOGY, n° 32. The word is formed from *dominica* or *dominicus dies*, "Lord's-day, Sunday."

The dominical letters were introduced in the calendar by the primitive Christians, in lieu of the NUNDINAL letters in the Roman calendar.

DOMINICAL, in church-history. The council of Auxerre, held in 578, decrees, that women communicate with their dominical. Some authors contend, that this dominical was a linen cloth, wherein they received the species; as not being allowed to receive them in the bare hand. Others will have it a kind of veil, wherewith they covered the head. The most probable account is, that it was a sort of linen cloth or handkerchief wherein they received and preserved the eu-

charist in times of persecution, to be taken on occasion at home. This appears to have been the case by the practice of the first Christians, and by Tertullian's book *Ad Uxorem*.

DOMINICANS, an order of religious, called in some places *Jacobins*; and in others, *Predicants*, or *Preaching Friars*.

The Dominicans take their name from their founder Dominic de Guzman, a Spanish gentleman, born in 1170, at Calaroga in Old Castile. He was first canon and archdeacon of Osma; and afterwards preached with great zeal and vehemence against the Albigenses in Languedoc, where he laid the first foundation of his order. It was approved of in 1215 by Innocent III. and confirmed in 1216 by a bull of Honorius III. under the title of *St Augustin*; to which Dominic added several austere precepts and observances, obliging the brethren to take a vow of absolute poverty, and to abandon entirely all their revenues and possessions; and also the title of *Preaching Friars*, because public instruction was the main end of their institution.

The first convent was founded at Tholouse by the bishop thereof and Simon de Montfort. Two years afterwards they had another at Paris, near the bishop's house; and some time after a third in the rue St Jacques, St James's street, whence the denomination of *Jacobins*.

Just before his death, Dominic sent Gilbert de Fresney, with twelve of the brethren, into England, where they founded their first monastery at Oxford in the year 1221, and soon after another at London. In the year 1276, the mayor and aldermen of the city of London gave them two whole streets by the river Thames, where they erected a very commodious convent, whence that place is still called *Black Friars*, from the name by which the Dominicans were called in England.

St Dominic, at first, only took the habit of the regular canons; that is, a black cassock and rochet: but this he quitted in 1219, for that which they now wear, which it is pretended was shown by the blessed Virgin herself to the beatified Renaud d'Orleans.

This order is diffused throughout the whole known world. It has forty-five provinces under the general, who resides at Rome; and twelve particular congregations or reforms, governed by vicars general.

They reckon three popes of this order, above sixty cardinals, several patriarchs, a hundred and fifty archbishops, and about eight hundred bishops; beside masters of the sacred palace, whose office has been constantly discharged by a religious of this order, ever since St Dominic, who held it under Honorius III. in 1218.

Of all the monastic orders, none enjoyed a higher degree of power and authority than the Dominican friars, whose credit was great, and their influence universal. But the measures they used in order to maintain and extend their authority were so perfidious and cruel, that their influence began to decline towards the beginning of the sixteenth century. The tragic story of Jetzer, conducted at Bern in 1509, for determining an uninteresting dispute between them and the Franciscans, relating to the *immaculate conception*, will reflect indelible infamy on this order. See an account of it in Burnet's Travels through France, Italy, Germany,

Dominica
caus.

dominion
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dominium.

and Switzerland, p. 31. or Mosheim's Eccl. Hist. vol. iii. p. 294, 8vo. They were indeed perpetually employed in stigmatizing with the opprobrious name of heresy numbers of learned and pious men; in encroaching upon the rights and properties of others, to augment their possessions; and in laying the most iniquitous snares and stratagems for the destruction of their adversaries. They were the principal counsellors, by whose instigation and advice Leo X. was determined to the public condemnation of Luther. The papal see never had more active and useful abettors than this order, and that of the Jesuits.

• The dogmata of the Dominicans are usually opposite to those of the Franciscans.

There are also nuns or sisters of this order, called in some places *Preaching Sisters*. These are even more ancient than the friars; St Dominic having founded a society of religious maids at Prouilles some years before the institution of his order of men; viz. in 1206.

There is also a third order of Dominicans, both for men and women.

DOMINION, DOMINIUM, in the civil law, signifies the power to use or dispose of a thing as we please.

DOMINION, or *Domination*. See DOMINATION.

DOMINIS (Mark Anthony de), archbishop of Spalatro in Dalmatia at the close of the 15th and beginning of the 16th centuries, was a man whose fickleness in religion proved his ruin. His preference, instead of attaching him to the church of Rome, rendered him disaffected to it. Becoming acquainted with our bishop Bedell, while chaplain to Sir Henry Wotton ambassador from James I. at Venice, he communicated his books *De Republica Ecclesiastica* to him; which were afterwards published at London, with Bedell's corrections. He came to England with Bedell; where he was received with great respect, and preached and wrote against the Romish religion. He is said to have had a principal hand in publishing father Paul's *HISTORY of the Council of Trent*, at London, which was inscribed to James in 1619. But on the promotion of Pope Gregory XIV. who had been his school-fellow and old acquaintance, he was deluded by Gondomar the Spanish ambassador into the hopes of procuring a cardinal's hat, by which he fancied he should prove an instrument of great reformation in the church. Accordingly he returned to Rome in 1622, recanted his errors, and was at first well received: but he afterwards wrote letters to England, repenting his recantation; which being intercepted, he was imprisoned by Pope Urban VIII. and died in 1625. He was also the author of the first philosophical explanation of the rainbow, which before his time was accounted a prodigy.

DOMINIUM EMINENS, in Scots law, that power which the state or sovereign has over private property, by which the proprietor may be compelled to sell it for an adequate price where public utility requires. See LAW, N° clxii. 1.

DOMINIUM DIRECTUM, in Scots law, the right which a superior retains in his lands, notwithstanding the feudal grant to his vassal. See LAW, N° clxvi. 1.

DOMINIUM UTILE, in Scots law, the right which the

vassal acquires in the lands by the feudal grant from his superior. See LAW, N° clxvi. 1.

DOMINUS, in ancient times, a title prefixed to a name, usually to denote the person either a knight or a clergyman. See *Vice-Dominus*.

The title was sometimes also given to a gentleman not dubbed; especially if he were lord of a manor. See DOM, GENTLEMAN, and SIRE.

In Holland, the title *dominus* is still retained, to distinguish a minister of the reformed church.

DOMITIAN, the Roman emperor, son to Vespasian, was the last of the 12 Cæsars. See (*History of*) ROME.

DON, or TANAIS, a river of Russia, which takes its rise from the small lake of St John, near Tula, in the government of Moscow, and passing through part of the province of Voronezh, a small portion of the Ukraina-Slobodskaja, and the whole province of Azof, divides itself near Tcherkask into three streams, and falls in these separate branches into the Sea of Azof. The river has so many windings, is in many parts so shallow, and abounds with such numerous shoals, as to be scarcely navigable, excepting in the spring, upon the melting of the snows; and its mouth is also so choaked up with sand, that only flat-bottomed vessels, excepting in the same season, can pass into the sea of Azof. The banks of the Don, and the rivulets which fall into it, are clothed with large tracts of forest, whose timber is floated down the stream to St Demetri and Rostof, where the frigates for the sea of Azof are chiefly constructed. The navigation of the Don, Mr Cox observes, may possibly hereafter be rendered highly valuable, by conveying to the Black Sea the iron of Siberia, the Chinese goods, and the Persian merchandize: which latter commodities, as well as the products of India, formerly found their way into Europe through this same channel.

DON is also the name of a river in Scotland, noticed under the article ABERDEEN; the Old Town being situated at its mouth. See ABERDEEN.

DONARIA, among the ancients, in its primary signification, was taken for the places where the oblations offered to the gods were kept; but afterwards was used to denote the offerings themselves; and sometimes, though improperly, the temples.

DONATIA, in botany: A genus of the trigynia order, belonging to the triandria class of plants. The calyx is a triphyllous perianthium, with short subulated leaves standing at a distance from one another. The corolla has from eight to ten petals of an oblong linear shape, twice as long as the calyx. The stamina are three subulated filaments the length of the calyx; the antheræ roundish, didymous, and two-lobed at the base.

DONATION, DONATIO, an act or contract whereby a man transfers to another either the property or the use of the whole or a part of his effects as a free gift.

A donation, to be valid and complete, supposes a capacity both in the donor and the donee; and requires consent, acceptance, and delivery; and by the French law registry also.

DONATION MORIS CAUSA, in law, a disposition of property made by a person in his last sickness, who apprehending

Dominus
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Donation.

Donatists. hending his dissolution near, delivers, or causes to be delivered to another, the possession of any personal goods, to keep in case of his decease. If the donor dies, this gift needs not the consent of his executor; but it shall not prevail against creditors; and it is accompanied with this implied trust, that, if the donor lives, the property shall revert to himself, being only given in prospect of death, or *mortis causa*. This method of donation seems to have been conveyed to us from the civil lawyers, who borrowed it from the Greeks.

DONATISTS, ancient schismatics in Africa, so denominated from their leader Donatus.

They had their origin in the year 311, when, in the room of Mensurius, who died in that year on his return to Rome, Cæcilian was elected bishop of Carthage, and consecrated without the concurrence of the Numidian bishops, by those of Africa alone; whom the people refused to acknowledge, and to whom they opposed Majorinus; who, accordingly, was ordained by Donatus bishop of Cæsæ Nigræ. They were condemned, in a council held at Rome, two years after their separation; and afterwards in another at Arles, the year following; and again at Milan, before Constantine the Great, in 316, who deprived them of their churches, and sent their seditious bishops into banishment, and punished some of them with death. Their cause was espoused by another Donatus, called the *great*, the principal bishop of that sect, who, with numbers of his followers, was exiled by order of Constantians. Many of them were punished with great severity. See *CIRCUMCELLIONES*. However, after the accession of Julian to the throne in 362, they were permitted to return, and restored to their former liberty. Gratian published several edicts against them; and in 377 deprived them of their churches, and prohibited all their assemblies. But notwithstanding the severities they suffered, it appears that they had a very considerable number of churches towards the close of this century; but at this time they began to decline, on account of a schism among themselves, occasioned by the election of two bishops, in the room of Parmenian, the successor of Donatus; one party elected Primian, and were called *Primianists*, and another Maximian, and were called *Maximianists*. Their decline was also precipitated by the zealous opposition of St. Augustine, and by the violent measures which were pursued against them, by order of the emperor Honorius, at the solicitation of two councils held at Carthage; the one in 404, and the other in 411. Many of them were fined, their bishops were banished, and some put to death. This sect revived and multiplied under the protection of the Vandals, who invaded Africa in 427, and took possession of this province; but it sunk again under new severities, when their empire was overturned in 534. Nevertheless, they remained in a separate body till the close of this century, when Gregory, the Roman pontiff, used various methods for suppressing them; his zeal succeeded, and there are few traces to be found of the Donatists after this period. They were distinguished by other appellations, as *Circumcelliones*, *Montenses*, or *Mountainers*, *Campites*, *Rupites*, &c. They held three councils, or conciliabules; that of Cirta in Numidia, and two at Carthage.

The errors of the Donatists, beside their schism, were, 1. That baptism conferred out of the church, that is, out of their sect, was null; and accordingly they rebaptized those who joined their party from other churches, and re-ordained their ministers. 2. That theirs was the only true, pure, and holy church; all the rest of the churches they held as prostitute and fallen.

Donatus seems likewise to have given into the doctrine of the Arians, with whom he was closely allied; and, accordingly, St. Epiphanius, Theodoret, and some others, accused the Donatists of Arianism; and it is probable that the charge was well founded, because they were patronized by the Vandals, who were of these sentiments. But St. Augustine, ep. 185, to count Boniface, & Her. 69, affirms, that the Donatists, in this point, kept clear of the errors of their leader.

DONATIVE, **DONATIVUM**, a present made by any person; called also *gratuity*.

The Romans made large donatives to their soldiery. Julia Pia, wife of the emperor Severus, is called on certain medals *mater castrorum*, because of the care she took of the soldiery, by interposing for the augmentation of their donatives, &c.

Donative was properly a gift made to the soldiery; as *congiarium* was that made to the people. Salmasius, on his notes to Lampridius, in his Life of Heliogabalus, mentioning a donative that emperor gave of three pieces of gold *per* head, observes, that this was the common and legitimate rate of a donative. Casaubon, in his notes on the Life of Pertinax by Capitolinus, observes, that Pertinax made a promise of 3000 denarii to each soldier; which amounts to upwards of 97 pounds sterling. The same author writes, that the legal donative was 20,000 denarii; and that it was not customary to give less, especially to the prætorian soldiers; that the centurions had double, and the tribunes, &c. more in proportion.

DONATIVE, in the canon law, a benefice given, and collated to a person, by the founder or patron; without either presentation, institution, or induction by the ordinary.

If chapels founded by laymen be not approved by the diocesan, and, as it is called, *spiritualized*, they are not accounted proper benefices, neither can they be conferred by the bishop, but remain to the pious disposition of the founders; so that the founders, and their heirs, may give such chapels without the bishop.

Gwin observes, that the king might of ancient time found a free chapel, and exempt it from the jurisdiction of the diocesan; so may he, by letters patent, give liberty to a common person to found such a chapel, and make it donative, not presentable; and the chaplain, or beneficiary, shall be deprivable by the founder or his heir, and not by the bishop. And this seems to be the original of donatives in England.

Donatives are within the statute against simony; and if they have cure of souls, within that against pluralities. If the patron of a donative doth not nominate a clerk, there can be no lapse thereof, unless it be specially provided for in the foundation; but the bishop may compel him to do it by spiritual censures. But if it be augmented by queen Anne's bounty, it will lapse like other presentative livings. 1 Geo. I. stat.

Dytiscus.



Dermestes.



Draco Volans.



Donax.



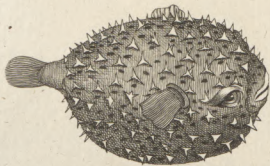
Doris.



Dodo.



Diodon.



Donatory
Donne

Donor
Doria.

2. cap. 10. The ordinary cannot visit a donative, and therefore it is free from procuracion, and the incumbent is exempted from attendance at visitations.

All bishopricks in ancient time were donative by the king. Again, where a bishop has the gift of a benefice, it is properly called a *donative*, because he cannot present to himself.

DONATORY, in Scots law, that person to whom the king bestows his right to any forfeiture that has fallen to the crown.

DONATUS, a schismatic bishop of Carthage, founder of the sect of DONATISTS. His followers swore by him, and honoured him like a god. He died about 368.

DONATUS (Ælius), a famous grammarian, lived at Rome in 354. He was one of St Jerome's masters; and composed commentaries on Terence and Virgil, which are esteemed.

DONAWERT, a strong town of Germany, in the circle of Bavaria on the frontiers of Suabia. It has been taken and retaken several times in the wars of Germany; and was formerly an imperial city, but at present is subject to the duke of Bavaria. E. Long. 10. 32. N. Lat. 48. 32.

DONAX, a genus of insects belonging to the order of vermes testacea. It is an animal of the oyster kind; and the shell has two valves, with a very obtuse margin in the fore-part. There are 10 species, principally distinguished by the figure of their shells.*

DONCASTER, a market-town of Yorkshire, 30 miles south of York. It was noted for knitting worsted stockings; that article of their trade is now on the decline. Doncaster gives the English title of Earl to the duke of Buccleugh in Scotland, which belonged to his ancestor the duke of Monmouth, but was omitted out of the forfeiture. W. Long. 1. o. N. Lat. 53. 30.

DONNE (Dr John), an excellent poet and divine of the 17th century. His parents were of the Romish religion, and used their utmost efforts to keep him firm to it; but his early examination of the controversy between the church of Rome and the Protestants, at last determined him to choose the latter. He travelled into Italy and Spain; where he made many useful observations, and learned their languages to perfection. Soon after his return to England, Sir Thomas Egerton, keeper of the great seal, appointed him his secretary; in which post he continued five years. He marrying privately Anne the daughter of Sir George Moore then chancellor of the garter, and niece to the lord keeper's lady, was dismissed from his place, and thrown into prison. But he was reconciled to Sir George by the good offices of Sir Francis Wolley. In 1612, he accompanied Sir Robert Drury to Paris. During this time, many of the nobility solicited the king for some special employment for him. But his majesty, who took pleasure in his conversation, had engaged him in writing his *Pseudo Martyr*, printed at London in 1610; and was so highly pleased with that work, that in 1614 he prevailed with him to enter into holy orders; appointed him one of his chaplains, and procured him the degree of Doctor of Divinity from the university of Oxford. In 1619, he attended the earl of Doncaster in his embassy into Germany. In 1621, he was made dean of St Paul's:

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and the vicarage of St Dunstan in the west, in London, soon after fell to him; the advowson of it having been given to him long before by Richard earl of Dorset. By these and other preferments, he was enabled to be charitable to the poor, kind to his friends, and to make good provision for his children. He wrote, besides the above, 1. Devotions upon emergent occasions. 2. The Ancient History of the Septuagint, translated from the Greek of Aristeus, quarto. 3. Three volumes of sermons, folio. 4. A considerable number of poems; and other works. He died in 1631; and was interred in St Paul's cathedral, where a monument was erected to his memory. His writings show him to be a man of incomparable wit and learning; but his greatest excellence was satire. He had a prodigious richness of fancy, but his thoughts were much debased by his verification. He was, however, highly celebrated by all the great men of that age.

DONOR, in law, the person who gives lands or tenements to another in tail, &c.; as he to whom such lands, &c. are given, is the *donee*.

DOOMSDAY BOOK. See DOMESDAY BOOK.

DOOR, in architecture. See ARCHITECTURE, n^o 76.

DOR, the English name of the common black beetle. Some apply it also to the dusty beetle, that flies about hedges in the evening. See SCARABÆUS.

DORADO, in astronomy, a southern constellation, not visible in our latitude; it is also called *xiphiæ*. The stars of this constellation, in Sharp's Catalogue, are six.

DORCHESTER, the capital of Dorsetshire, situated on the river Frome, six miles north of Weymouth: W. Long. 2. 35. N. Lat. 50. 40. It gives the title of marquis to the noble family of Pierpoint, duke of Kingston; and sends two members to parliament.

DOREE, or JOHN DOREE, in ichthyology. See ZEUS.

DORIA (Andrew), a gallant Genoese sea-officer, born in 1466. He entered into the service of Francis I. of France; but preserved that spirit of independence so natural to a sailor and a republican. When the French attempted to render Savona, long the object of jealousy to Genoa, its rival in trade, Doria remonstrated against the measure in a high tone; which bold action, represented by the malice of his courtiers in the most odious light, irritated Francis to that degree, that he ordered his admiral Barbicieux to sail to Genoa, then in the hands of the French troops, to arrest Doria, and to seize his galleys. This rash order Doria got timely hints of; retired with all his galleys to a place of safety; and, while his resentment was thus raised, he cloied with the offers of the emperor Charles V. returned his commission with the collar of St Michael to Francis, and hoisted the Imperial colours. To deliver his country, weary alike of the French and Imperial yoke, from the dominion of foreigners, was now Doria's highest ambition; and the favourable moment offered. Genoa was afflicted with the pestilence, the French garrison was greatly reduced and ill-paid, and the inhabitants were sufficiently disposed to second his views. He sailed to the harbour with 13 galleys, landed 500 men, and made himself master of the gates and the palace with very little resistance. The French governor with his feeble garrison retired to the citadel,

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XIV.

Doric.

but was quickly forced to capitulate; when the people ran together, and levelled the citadel with the ground. It was now in Doria's power to have rendered himself the sovereign of his country; but, with a magnanimity of which there are few examples, he assembled the people in the court before the palace, disclaimed all pre-eminence, and recommended to them to settle that form of government they chose to establish. The people, animated by his spirit, forgot their factions, and fixed that form of government which has subsisted ever since with little variation. This event happened in 1528. Doria lived to a great age, respected and beloved as a private citizen; and is still celebrated in Genoa by the most honourable of all appellations, "The father of his country, and the restorer of its liberty."

DORIC, in general, any thing belonging to the Dorians, an ancient people of Greece, inhabiting near mount Parnassus. See **DORIS**.

DORIC, in architecture, is the second of the five orders; being that between the Tuscan and Ionic. It is usually placed upon the Attic base, though originally it had no base. See **ARCHITECTURE**, n° 43.

At its first invention it was more simple than at present; and when in after-times they came to adorn and enrich it more, the appellation *Doric* was restrained to this richer manner, and the primitive simple manner they called by a new name, the Tuscan order, which was chiefly used in temples; as the former, being more light and delicate, was for porticos and theatres. The tradition is, that Dorus, king of Achaia, having first built a temple of this order at Argos, which he dedicated to Juno, occasioned it to be called *Doric*; though others derive its name, from its being invented or used by the Dorians.

The moderns, on account of its solidity, use it in large strong buildings; as in the gates of cities and citadels, the outides of churches, and other massy works, where delicacy of ornaments would be unsuitable. The gate of Burlington-house in Piccadilly is of the Doric order.

The most considerable antient monuments of this order, are the theatre of Marcellus at Rome; wherein the capital, the height of the frize, and its projecture, are much smaller than in the modern architecture; and the Parthenion, or temple of Minerva at Athens, in which the short and massy columns bear upon the pavement without a base; and the capital is a simple torus, with its cincture, and a square, plain, and solid abacus.

DORIC Cymatium. See **CYMA**.

DORIC Dialect, one of the five dialects, or manners of speaking, which obtained among the Greeks.

It was first used by the Lacedæmonians, and particularly those of Argos; thence it passed into Epirus, Libya, Sicily, the islands of Rhodes, and Crete. In this dialect, Archimedes and Theocritus wrote, who were both of Syracuse; as likewise Pindar.

In strictness, however, we should rather define Doric, the manner of speaking peculiar to the Dorians, after their recess near Parnassus and Afopus; and which afterwards came to obtain among the Lacedæmonian, &c. Some even distinguish between the Lacedæmonian and Doric; but, in reality, they were the same; setting aside a few particularities in the

language of the Lacedæmonians; as is shown by Rulandus, in his excellent treatise *De Lingua Græca ejusque Dialectis*, lib. v.

Beside the authors already mentioned to have written in the Doric dialect, we might add Archytas of Tarentum, Bion, Callinus, Simonides, Bacchylides, Cypselas, Aleman, and Sophron.

Most of the medals of the cities of Græcia Magna, and Sicily, favour of the Doric dialect in their inscription: witness, ΑΜΒΡΑΚΙΩΤΑΝ, ΑΠΟΛΛΩΝΙΑΤΑΝ, ΑΞΕΡΟΝΤΑΝ, ΑΚΤΡΙΑΝ, ΗΡΑΚΛΕΙΑΤΑΝ, ΤΡΑΧΙΝΙΩΝ, ΟΡΕΜΙΤΑΝ, ΚΑΤΑΟΝΙΑΤΑΝ, ΚΟΛΙΑΤΑΝ, ΤΑΤΡΟΜΕΝΙΑΤΑΝ, &c. Which shows the countries wherein the Doric dialect was used.

The general rules of this dialect are thus given by the Port-royalists.

D'ici vers, d'o grand, d'et, do & d'o l'a fait le Doric.

D'ici fait vers, d'o, o; & d'o au fait encore.

Offe i de l'infini: & pour le singulier.

Se sert au féminin du nombre pluriel.

But they are much better explained in the fourth book of Rulandus; where he even notes the minuter differences of the dialects of Sicily, Crete, Tarentum, Rhodes, Lacedæmon, Laconia, Macedonia, and Thessaly.

The *a* abounds every where in the Doric; but this dialect bears so near a conformity with the Æolic, that many reckon them but one.

DORIC Mode, in music, the first of the authentic modes of the ancients. Its character is to be severe, tempered with gravity and joy; and is proper upon religious occasions, as also to be used in war. It begins *D, la, sol, re*. Plato admires the music of the Doric mode, and judges it proper to preserve good manners as being masculine; and on this account allows it in his commonwealth. The ancients had likewise their subdoric or hypodoric mode, which was one of the plagal modes. Its character was to be very grave and solemn: it began with *re*, a fourth lower than the doric.

DORING, or **DARING**, among sportsmen, a term used to express a method of taking larks, by means of a clap-net and a looking-glass. For this sport there must be provided four sticks very straight and light, about the bigness of a pike; two of these are to be four feet nine inches long, and all notched at the edges or the ends. At one end of each of these sticks there is to be fastened another of about a foot long on one side; and on the other side a small wooden peg about three inches long. Then four or more sticks are to be prepared, each of one foot length; and each of these must have a cord of nine feet long fastened to it at the end. Every one should have a buckle for the commodious fastening on to the respective sticks when the net is to be spread.—A cord must also be provided, which must have two branches. The one must have nine feet and a half, and the other ten feet long, with a buckle at the end of each; the rest, or body of the cord, must be 24 yards long. All these cords, as well the long ones as those about the sticks, must be well twisted and of the bigness of one's little finger. The next thing to be provided is a staff of four feet long, pointed at one end, and with a ball of wood at the other, for the carrying these conveniences in a sack or wallet.—There should also be carried, on this occasion, a spade to

Doric.

Doring.

Doris.
Doris.

to level the ground where there may be any little irregularities; and two small rods, each 18 inches long, and having a small rod fixed with a pack-thread at the larger end of the other. To these are to be tied some pack-thread loops, which are to be fasten in the legs of some larks; and there are to be reels to these, that the birds may fly a little way up and down. When all this is done, the looking-glass is to be prepared in the following manner. Take a piece of wood about an inch and an half thick, and cut it in form of a bow, so that there may be about nine inches space between the two ends; and let it have its full thickness at the bottom, that it may receive into it a false piece; in the five corners of which there are to be set in five pieces of looking-glass. These are to be fixed, that they may dart their light upwards; and the whole machine is to be supported on a moveable pin, with the end of a long line fixed to it, and made in the manner of the children's play-thing of an apple and a plum-stone; so that the other end of the cord being carried through a hedge, the barely pulling it may set the whole machine of the glasses a-turning. This and the other contrivances are to be placed in the middle between the two nets. The larks fixed to the place, and termed *calls*, and the glittering of the looking-glasses as they twirl round in the sun, invite the other larks down; and the cord that communicates with the nets, and goes through the hedge, gives the person behind an opportunity of pulling up the nets, so as to meet over the whole, and take every thing that is between them. The places where this sort of sporting succeeds best are open fields remote from any trees and hedges except one by way of shelter for the sportsman: and the wind should always be either in the front or back; for if it blows sideways, it prevents the playing of the net.

DORIS, a country of Greece, between Phocis, Thessaly, and Acarnania. It received its name from Dorus the son of Deucalion, who made a settlement there. It was called *Tetrapolis* from the four cities of Pindus or Dryopis, Erineum, Cytinium, Borium, which it contained. To these four some add Lilæum and Carphæa, and therefore call it *Hexapolis*. The name of Doris has been common to many parts of Greece. The Dorians in the age of Deucalion inhabited Phthiotis, which they exchanged for Histirotis, in the age of Dorus. From thence they were driven by the Cadmeans, and came to settle near the town of Pindus. From thence they passed into Dryopis, and afterwards into Peloponnesus. Hercules having re-established Ægimius king of Phthiotis or Doris, who had been driven from his country by the Lapithæ, the grateful king appointed Hyllus the son of his patron to be his successor, and the Heraclidæ marched from that part of the country to go to recover Peloponnesus. The Dorians sent many colonies into different places, which bore the same name as their native country. The most famous of these is in Asia Minor, of which Halicarnassus was once the capital. This part of Asia Minor was called *Hexapolis*, and afterwards *Pentapolis*.

DORIS, a genus of insects, belonging to the order of vermes testacea. The body is oblong, flat beneath; creeping: mouth placed below: vent behind surrounded with a fringe: two feelers, retractile. There are

several species.—The argo, or lemon doris, has an oval body, convex, marked with numerous punctures, of a lemon colour, the vent beset with elegant ramifications. It inhabits different parts of our seas, called about Brightelmstone the *sea-lemon*. See Plate CLXIV.

DORMANT, in heraldry, is used for the posture of a lion, or any other beast, lying along in a sleeping attitude with the head on the fore-paws; by which it is distinguished from the *couchant*, where though the beast is lying, yet he holds up his head.

DORMER, in architecture, signifies a window made in the roof of an house, or above the entablature, being raised upon the rafters.

DORMITORY, a gallery in convents or religious houses, divided into several cells, in which the religious sleep or lodge.

DORMOUSE, in zoology. See *Mus* and *Sciurus*.

DORONICUM, LEOPARD'S BANE: A genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The receptacle is naked, the pappus simple; the scales of the calyx in a double row, longer than the disc. The seeds of the radius naked without any pappus. There are three species; of which the only one worthy of notice is the pardalanches, with obtuse heart-shaped leaves. It grows naturally in Hungary, and on the Helvetian mountains; but is frequently preferred in the English gardens. It hath thick fleshy roots, which divide into many knobs or knees, sending out strong fleshy fibres which penetrate deep into the ground; from these arise in the spring a cluster of heart-shaped leaves, which are hairy, and stand upon footstalks: between these arise the flower-stalks, which are channelled and hairy, near three feet high, putting out one or two smaller stalks from the side. Each stalk is terminated by one large yellow flower. The plant multiplies very fast by its spreading roots; and the seeds, if permitted to scatter, will produce plants wherever they happen to fall; so that it very soon becomes a weed in the places where it is once established. It loves a moist soil and shady situation. The roots were formerly used in medicine as alexipharmics and purifiers of the blood, but their operation was so violent that they are now entirely laid aside.

DORSAL, an appellation given to whatever belongs to the back. See *Dorsum*.

DORSET (Thomas Sackville), Lord Buckhurst. See *Sackville*.

DORSET (Charles Sackville), Earl of. See *Sackville*.

DORSETSHIRE, a county of England, bounded on the south by the English channel, on the north by Somersetshire and Wiltshire, on the east by Hampshire, and on the west by Devonshire and some part of Somersetshire. It is between 40 and 50 miles long from east to west, and 34 broad from south to north, and contains 34 hundreds, 22 market-towns, and 248 parishes. This county enjoys a mild, pleasant, and wholesome air, and a deep, rich, and fertile soil, finely diversified. Towards the north it is level, under the high lands that divide it from Somersetshire, where there are fine arable grounds that will yield large crops of different kinds of grain. But on the south, from

Dormant
Dorset-
shire.

Dorsiferous the borders of Hampshire by the sea-coast, for an extent of almost 20 miles in length, and in some places four or five in breadth, is an heathy common, which renders this country less populous than it otherwise would be. From east to west run a ridge of hills called the *Dwans*, abounding with sweet and short herbage, which nourishes a vast number of sheep equally esteemed for their flesh and fleece. The country is also very plentifully watered; and in all respects so well suited both for pleasure and profit, that it was distinguished by the Romans above all others. They had many stations and summer-camps in Dorsetshire than in any other county. That the Saxons had the same regard for it, is evident from the number of palaces they had in it, the stately ministers they built, and the express directions they gave that their bodies should be interred in those monuments of their piety. This country yields many and very valuable commodities. The quarries in Purbeck and Portland supply stones of different qualities, suited to various uses, and in prodigious quantities, together with some very rich and beautiful marble. The best tobacco-pipe clay in England is also found in this country. Madder, hemp, and flax, also thrive in many places, grain of all sorts, &c.

DORSIFEROUS PLANTS, among botanists, such as are of the capillary kind, without stalks, and which bear their seeds on the back-side of their leaves.

DORSTENIA, CONTRAYERVA: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 53d order, *Scabride*. The receptacle is common, monophyllous, and carnosus; the seeds lying singly in the carnosus substance. There are four species, all of them low herbaceous plants, growing in the warm countries of America. The root is used in medicine. It is full of knots; an inch or two in length, about half an inch thick; externally of a reddish brown colour, and pale within; long, tough, slender fibres shoot out from all sides of it, which are generally loaded with small round knots. The root has a peculiar kind of aromatic smell, and a somewhat astringent, warm, bitterish taste, with a light and sweetish kind of acrimony when chewed. The fibres have little taste or smell; the tuberous part therefore should only be chosen.—*Contrayerva* is one of the mildest of those substances called *alexipharmics*: it is indisputably a good and useful diaphoretic. Its virtues are extracted both by water and rectified spirit, and do not arise by evaporation with either. The plants cannot be propagated in this country without the greatest difficulty.

DORSUM, the BACK, in anatomy, comprehends all the posterior part of the trunk of the body from the neck to the buttocks. See *ANATOMY*, n° 29, &c.

DORT, or DORDRECHT, a city of Holland, which holds the first rank in the assembly of the states. It is seated in a small island formed by the rivers Meuse, Merue, Rhine, and Linghe. The Meuse, on which it stands, gives it a good harbour, and separates it from the islands of IJsselmonde and Abias. It is divided from Beyerland by a canal. The harbour is very commodious for the merchandizes which come down the Rhine and the Meuse, which keep it in a flourishing condition. Its strength consists in being surrounded with water. Its walls are old, and defended by round towers. It is very rich, and well built with brick, and

had formerly the exclusive right of coining money. It is at present the staple town for wines, particularly Rhenish. It was detached from the main land in 1421, on the 17th of November, by a flood occasioned by the breaking down of the dyke, which overwhelmed 70 villages, and about 100,000 persons. However, by time and the industry of the inhabitants, a great part of the land is recovered. It has two principal canals, namely, the New and Old Haven, by which heavily-loaded vessels may enter into the city. Over the Old Haven is a large bridge well built with brick.

Dort was almost reduced to ashes in the year 1457; there being then consumed 2000 houses, with the halls, hospital, and church of Notre Dame; but they are now well provided with fire-engines and watchmen to prevent the like disaster. This city is famous for the meeting of the clergy called the *Senate of Dort*, in which the Calvinists obtained a sentence against the Arminians, who were called the *Remonstrants*. The dispute between the contending parties occasioned strange disorders, skirmishes, and murders, in most of the principal cities. Those ministers who would not subscribe to the decree of the synod were banished, of whom there were above 100. E. Long. 4. 36. N. Lat. 51. 39.

Synod of Dort, a national synod, summoned by authority of the States General, the provinces of Holland, Utrecht, and Overysel excepted, and held at Dort in 1618. The most eminent divines of the United Provinces, and deputies from the churches of England, Scotland, Switzerland, Bremen, Hesse, and the Palatinate, assembled on this occasion in order to decide the controversy between the Gomarists or Calvinists and Arminians; the latter of whom were declared corrupters of the true religion. But the authority of this synod was far from being universally acknowledged either in Holland or in England. The provinces of Friesland, Zealand, Utrecht, Guelderland, and Groningen, could not be persuaded to adopt their decisions; and they were opposed by the authority of Archbishop Laud and King James I. in England. The reformed churches in France, though at first disposed to give a favourable reception to the decisions of this famous synod, in process of time espoused doctrines very different from those of the Gomarists; and the churches of Brandenburg and Bremen would not suffer their doctors to be tied down to the opinions and tenets of the Dutch divines. The liberty of private judgment with respect to the doctrines of predestination and grace, which the spirit that prevailed among the divines of Dort seemed so much adapted to discourage and suppress, acquired new vigour in consequence of the arbitrary proceedings of this assembly.

DORTMUND, a rich, populous, and imperial city of Germany, in the circle of Westphalia. It is pretty large, but not well built. Formerly it was one of the Hanse towns. Its territory also was formerly a county, and had lords of its own; but since 1504, it hath been possessed entirely by the city.

DORYPHORI (from *dory* spear, and *phor* I bear), an appellation given to the life-guard-men of the Roman emperors. They were held in such high estimation, as frequently to have the command of armies conferred on them.—It was usual also for chief commanders to have their doryphori or life-guard to attend them.

DOSE,

Dort
Doryphori.

Die

Defil

DOSE, in pharmacy, &c. the quantity of a medicine to be taken at one time. The word is formed from the Greek *δosis*, which signifies *gift*, or a thing given; from *δοω* *do*, "I give."

DOSITHEANS, DOSITHEI, an ancient sect among the Samaritans in the first century of the Christian era.

Mention is made in Origen, Epiphanius, Jerom, and divers other Greek and Latin fathers, of one Dositheus, the chief of a faction among the Samaritans; but the learned are not at all agreed as to the time wherein he lived. St. Jerom, in his dialogue against the Luciferians, places him before our Saviour; wherein he is followed by Druhus, who in his answer to Scerratus places him about the time of Sennacherib king of Assyria. But Scaliger will have him posterior to our Saviour's time: And in effect Origen intimates him to have been contemporary with the apostles; where he observes, that he endeavoured to persuade the Samaritans that he was the Messiah foretold by Moses.

He had many followers; and his sect was still subsisting at Alexandria in the time of the patriarch Eulogius, as appears from a decree of that patriarch published by Photius. In that decree, Eulogius accuses Dositheus of injuriously treating the ancient patriarchs and prophets, and attributing to himself the spirit of prophecy. He makes him contemporary with Simon Magus; and accuses him of corrupting the Pentateuch in divers places, and of composing several books directly contrary to the law of God.

Archbishop Usher takes Dositheus to be the author of all the changes made in the Samaritan Pentateuch, which he argues from the authority of Eulogius. But we can justly gather from the testimony of Eulogius is, that Dositheus corrupted the Samaritan copies since used by that sect; but that corruption did not pass into all the copies of the Samaritan Pentateuch now in use among us, which vary but little from the Jewish Pentateuch: And in this sense we are to understand that passage in a Samaritan chronicle, where it is said that Domsis, *i. e.* Dositheus, altered several things in the law of Moses. The author of that chronicle, who was a Samaritan by religion, adds, that their high-priest sent several Samaritans to seize Domsis and his corrupted copy of the Pentateuch.

Epiphanius takes Dositheus to have been a Jew by birth, and to have abandoned the Jewish party for that of the Samaritans. He imagines him likewise to have been the author of the sect of the Sadducees: Which seems inconsistent with his being later than our Saviour; and yet the Jesuit Serrarius agrees to make Dositheus the master of Sadoc, from whom the Sadducees are derived.

Tertullian, making mention of the same Dositheus, observes, that he was the first who dared to reject the authority of the prophets by denying their inspiration. But he charges that as a crime peculiar to this sectary, which in reality is common to the whole sect, who have never allowed any but the five books of Moses for divine.

DOSSER, a sort of basket to be carried on the shoulders of men. It is used in carrying the overplus earth from one part of a fortification to another where it is wanted. There are likewise small carts and wheelbarrows for the same use.

DOSSIL, in surgery, is lint made into a cylindric

form, or resembling the shape of dates or olive-stones. Doffils are sometimes secured by a thread tied round their middle.

DOTTEREL, in ornithology. See CHARADRIUS.
DOU, or Douw, (Gerard). See DOUW.

DOLLAY, or Doway, a large and strong city of the

DOUAY, a large and strong city of the French Netherlands, situated in E. Long. 3. o. N. Lat. 50. 25. It is situated on the river Scarpe, in a very fertile and pleafant country. The town is large and populous, and exceedingly well fortified. You enter it by fix gates, and the freets from each of thefe gates lead to the market-place. Here is a venerable old town-houfe, adorned with the ftatues of the earls of Flanders, in which the magiftrates afemble, and are renewed every thirteen months. Here alfo are held feveral country courts for the dependencies of Douay, which contain about 30 villages. The parliament of Douay was at firft only a fupreme council, eftablifhed at Tournay in 1658, and erected into a parliament in 1686. But Tournay being taken by the allies in 1709, the parliament was removed to Cambray; and upon the yielding of Tournay to the Auftrians by the treaty of Utrecht, the parliament was removed to Douay, where it ftill continues. This city was erected into an

university like that of Louvain by Philip II. because of its being in the middle of so many great cities, and Louvain at so great a distance, that the children on that side of the country were generally sent for their education into France. It contains 14 colleges, all governed and settled after the manner of those at Louvain; and the schools of philosophy, canon and civil law, and physic, are disposed also after the same manner, only the rector here is chosen annually. There is a considerable seminary here of English Roman Catholics, founded by Philip II. of Spain about the year 1569. There is also a great number of convents; and among the rest two English, one of Franciscan friars, the other of Benedictine monks. Douay was taken from the Spaniards by the French king in person in 1667, after a short resistance. That prince made it very strong, and built a fort about a cannon shot below it upon the Scarp, with sluices, by which the adjacent country could be drowned. The allies laid siege to it in 1710, under the command of the Duke of Marlborough; and after a vigorous defence, the town and Fort Scarp surrendered upon honourable terms. It was retaken by the French in 1712, after the suspension of arms between Great Britain and France.

DOUBLE; two of a sort, one corresponding to the other.

DOUBLE Children, Double Cats, Double Pears, &c. Instances of these are frequent in the *Philosoph. Transact.* and elsewhere. See MONSTER.

Sir John Mayer, in the fame *Transactions*, giving an account of a *double turkey*, furnishes some reflections on the production of *double animals* in general. Two turkeys, he relates, were taken out of an egg of the common size, when the rest were well hatched, which grew together by the flesh of the breast-bone, but in all other parts were distinct. They seemed less than the ordinary size, as wanting bulk, nutriment, and room for their growth; which latter, too, was apparently the occasion of their cohesion. For, having two distinct cavities in their bodies, and two hearts, they must have arisen from two cicatriculas; and, consequently,

Dotterel

Double.

Double.

quently, the egg had two yolks; which is no uncommon accident. He mentions a dried *double chicken* in his possession, which, though it had four legs, four wings, &c. had but one cavity in the body, one heart, and one head; and, consequently, was produced from one cicatricula.

So, Paræus mentions a *double infant*, with only one heart: in which case, the original or flamen of the infant was one, and the vessels regular; only, the nerves and arteries towards the extremities dividing into more branches than ordinary, produced *double parts*.

The same is the case in the *double flowers* of plants, occasioned by the richness of the soil. So it is in the eggs of quadrupeds, &c.

There are, therefore, two reasons of duplicity in embryos: 1. The conjoining or connection of two perfect animals; and, 2. An extraordinary division and ramification of the original vessels, nerves, arteries, &c.

DOUBLE Employment, in music, a name given by M. Rameau to the two different manners in which the chord of the sub-dominant may be regarded and treated, viz. as the fundamental chord of the sixth super-added, or as the chord of the great sixth, inverted from a fundamental chord of the seventh. In reality, the chords carry exactly the same notes, are figured in the same manner, are employed upon the same chord of the tone, in such a manner, that frequently we cannot discern which of the two chords the author employs, but by the assistance of the subsequent chord, which resolves it, and which is different in these different cases.

To make this distinction, we must consider the diatonic progress of the two notes which form the fifth and the sixth, and which, constituting between them the interval of a second, must one or the other constitute the dissonance of the chord. Now, this progress is determined by the motion of the bass. Of these two notes, then; if the superior be the dissonance, it will rise by one gradation into the subsequent chord, the lower note will keep its place, and the higher note will be a super-added sixth. If the lower be the dissonance, it will descend into the subsequent chord, the higher will remain in its place, and the chord will be that of the great sixth. See the two cases of the *double employment* in Rousseau's Musical Dictionary, Plate D, fig. 12.

With respect to the composer, the use which he may make of the double-employment, is to consider the chord in its different points of view, that from thence he may know how to make his entrance to it, and his exit from it; so that having arrived, for instance, at the chord of the super-added sixth, he may resolve it as a chord of the great sixth, and reciprocally.

M. D'Alembert has shown, that one of the chief uses of the double-employment is, that we be able to carry the diatonic succession of the gamut even to an octave, without changing the mode, at least whilst we rise; for in descending we must change it. Of this gamut and its fundamental bass, an example will be found in Rousseau's Musical Dictionary, Plate D, fig. 13. It is evident, according to the system of M. Rameau, that all the harmonic successions which result from it, are in the same tone: for, in strictness, no other chords are there employed but three, that of the tonic, that of the dominant, and that of the sub-dominant; as this last, in the double-employment, constitutes the seventh from the second note, which is employed upon the sixth.

Double.

With respect to what M. D'Alembert adds in his Elements of Music, p. 80. and which he repeats in the Encyclopédie, article *Double-emploi*, viz. that the chord of the seventh *re fa la ut*, though we should even regard it only as an inversion of *fa la ut re*, cannot be followed by the chord *ut mi sol ut*; "I cannot (says Rousseau) be of his opinion in this point.

"The proof which he gives for it is, that the dissonance *ut* of the first chord cannot be resolved in the second; and this is true, since it remains in its place: but in this chord of the seventh *re fa la ut*, inverted from this chord of the super-added sixth *fa la ut re*, it is not the *ut*, but the *re*, which is the dissonance; which, of consequence, ought to be resolved in ascending upon *mi*, as it really does in the subsequent chord; so that this procedure in the bass itself is forced, which, from *re*, cannot without an error return to *ut*, but ought to ascend to *mi*, in order to resolve the dissonance.

"M. D'Alembert afterwards shows, that this chord *re fa la ut*, when preceded and followed by that of the tonic, cannot be authorized by the double-employment; and this is likewise very true; because this chord, tho' figured with a 7, is not treated as a chord of the seventh, neither when we make our entrance to it, nor our exit from it; or at least that it is not necessary to treat it as such, but simply as an inversion of the super-added sixth, of which the dissonance is the bass; in which case we ought by no means to forget, that this dissonance is never prepared. Thus, though in such a transition the double-employment is not in question, though the chord of the seventh be no more than apparent, and impossible to be resolved by the rules, this does not hinder the transition from being proper and regular, as I have just proved to theorists. I shall immediately prove to practical artists, by an instance of this transition; which certainly will not be condemned by any one of them, nor justified by any other fundamental bass except my own. (See the Musical Dictionary, Plate D, fig. 14.)

"I acknowledge, that this inversion of the chord of the sixth super-added, which transfers the dissonance to the bass, has been censured by M. Rameau. This author, taking for a fundamental chord the chord of the seventh, which results from it, rather chose to make the fundamental bass descend diatonically, and resolve one seventh by another, than to unfold this seventh by an inversion. I had dissipated this error, and many others, in some papers which long ago had passed into the hands of M. D'Alembert, when he was composing his Elements of Music; so that it is not his sentiment which I attack, but my own opinion which I defend."

For what remains, the double-employment cannot be used with too much reserve, and the greatest masters are the most temperate in putting it in practice.

DOUBLE Fichy, or *Fiché*, in heraldry, the denomination of a cross, when the extremity has two points, in contradistinction to *fishé*, where the extremity is sharpened away to one point.

DOUBLE Octave, in music, an interval composed of fifteen notes in diatonic progression; and which, for that reason, is called a *fifteenth*. "It is (says Rousseau) an interval composed of two octaves, called by the Greeks *disdiapason*."

It deserves, however, to be remarked, that in intervals less distant and compounded, as in the *third*, the *fifth*, the

Doublet. the *simple octave*, &c. the lowest and highest extremes are included in the number from whence the interval takes its name. But, in the *double octave*, when termed a fiftieth, the simple number of which it is composed gives the name. This is by no means analogical, and may occasion some confusion. We should rather choofe, therefore, to run any hazard which might occur from uniformly including all the terms of which the component intervals confist, and call the *double octave* a sixteenth, according to the general analogy. See INTERVAL.

DOUBLET, among lapidaries, implies a counterfeit stone composed of two pieces of crystal, and sometimes glafs softened, together with proper colours between them; so that they make the same appearance to the eye as if the whole substance of the crystal had been tinged with these colours.

The impracticability of imparting tinges to the body of crystals, while in their proper and natural state, and the softness of glafs, which renders ornaments made of it greatly inferior in wear to crystal, gave inducements to the introduction of colouring the surface of crystal wrought in a proper form, in such a manner, that the surfaces of two pieces so coloured being laid together, the effect might appear the same as if the whole substance of the crystal had been coloured. The crystals, and sometimes white transparent glafs so treated, were called *doublets*; and at one time prevailed greatly in use, on account of the advantages, with respect to wear, such doublets had, when made of crystal, over glafs, and the brightness of the colours which could with certainty be given to counterfeit stones this way, when coloured glafs could not be procured, or at least not without a much greater expence. Doublets have not indeed the property which the others have, of bearing to be set transparent, as is frequently required in drops of ear-rings and other ornaments: but when mounted in rings, or used in such manner that the sides of the pieces, where the joint is made, cannot be inspected, they have, when formed of crystal, the title to a preference to the coloured glafs; and the art of managing them is therefore, in some degree, of the same importance with that of preparing glafs for the counterfeiting gems; and is therefore properly an appendage to it, as being entirely subservient to the same intention. The manner of making doublets is as follows:

Let the crystal or glafs be first cut by the lapidaries in the manner of a brilliant, except that, in this case, the figure must be composed from two separate stones, or parts of stones, formed in the manner of the upper and under parts of a brilliant, if it was divided in an horizontal direction, a little lower than the middle. After the two plates of the intended stone are thus cut, and fitted so exactly that no division can appear when they are laid together, the upper part must be polished ready for setting; and then the colour must be put betwixt the two plates by this method. "Take of Venice or Cyprus turpentine two scruples; and add to it one scruple of the grains of mallich chosen perfectly pure, free from foulness, and previously powdered. Melt them together in a small silver or brass spoon ladle, or other vessel, and put to them gradually any of the coloured substances below mentioned, being first well powdered; stirring them together as the colour is put

in, that they may be thoroughly commixed. Warm then the doublets to the same degree of heat as the melted mixture; and paint the upper surface of the lower part, and put the upper one instantly upon it, pressing them to each other, but taking care that they may be conjoined in the most perfectly even manner. When the cement or paint is quite cold and set, the redundant part of it, which has been pressed out of the joint of the two pieces, should be gently scraped off the side, till there be no appearance of any colour on the outside of the doublets: and they should then be skilfully set; observing to carry the mounting over the joint, that the upper piece may be well secured from separating from the under one."

The colour of the ruby may be best imitated, by mixing a fourth part of carmine with some of the finest crimson lake that can be procured.

The sapphire may be counterfeited by very bright Prussian blue, mixed with a little of the above mentioned crimson lake, to give it a cast of the purple. The Prussian blue should not be very deep-coloured, or but little of it should be used: for otherwise, it will give a black shade that will be injurious to the lustre of the doublets.

The emerald may be well counterfeited by distilled verdigrease, with a little powdered aloes. But the mixture should not be strongly heated, nor kept long over the fire after the verdigrease is added: for the colour is to be soon impaired by it.

The resemblance of the garnet may be made by dragon's blood; which, if it cannot be procured of sufficient brightness, may be helped by a very small quantity of carmine.

The amethyst may be imitated by the mixture of some Prussian blue with the crimson lake; but the proportions can only be regulated by direction, as different parcels of the lake and Prussian blue vary extremely in the degree of strength of the colour.

The yellow topazes may be counterfeited by mixing the powdered aloes with a little dragon's blood, or by good Spanish annatto: but the colour must be very sparingly used, or the tinge will be too strong for the appearance of that stone.

The chrysolite, hyacinth, vinegar garnet, eagle marine, and other such weaker or more diluted colours, may be formed in the same manner, by lessening the proportions of the colours, or by compounding them together correspondently to the hue of the stone to be imitated; to which end it is proper to have an original stone, or an exact imitation of one, at hand when the mixture is made, in order to the more certain adapting the colours to the effect desired: and when these precautions are taken, and the operation well conducted, it is practicable to bring the doublets to so near a resemblance of the true stones, that even the best judges cannot distinguish them, when well set, without a peculiar manner of inspection.

There is, however, an easy method of distinguishing doublets, which is only to behold them betwixt the eye and light, in such position, that the light may pass through the upper part and corners of the stone; when it will easily be perceived that there is no colour in the body of the stone.

DOUBLETS, a game on dice within tables; the men, which are only 15, being placed thus: Upon the
 side,

**Doublet,
Doublets.**

Doubling
||
Doubting.

five, cinque, and quatre points, there stand three men a-piece; and upon the trey, duce, and ace, only two. He that throws highest hath the benefit of throwing first, and what he throws he lays down, and so doth the other: what the one throws, and hath not, the other lays down for him, but on his own account; and thus they do till all the men are down, and then they bear. He that is down first, bears first; and will doubtless win the game, if the other throws not doubtlets to overtake him: which he is sure to do, since he advances or bears as many as the doubtlets make, viz. eight for two fours.

DOUBLING, in the military art, is the putting two ranks or files of soldiers into one. Thus, when the word of command is, *double your ranks*, the second, fourth, and sixth ranks march into the first, third, and fifth, so that the six ranks are reduced to three, and the intervals between the ranks become double what they were before.

DOUBLING, among hunters, who say that a hare doubles, when he keeps in plain fields, and winds about to deceive the hounds.

DOUBLING, in the manege, a term used of a horse, who is said to double his reins, when he leaps several times together, to throw his rider: thus we say, *the ramingue doubles his reins, and makes postlevis*.

DOUBLING, in navigation, the act of sailing round, or passing beyond, a cape or promontory, so as that the cape or point of land separates the ship from her former situation, or lies between her and any distant observer.

DOUBLING-UPON, in naval tactics, the act of inclining any part of a hostile fleet between two fires, or of cannonading it on both sides.

It is usually performed by the van or rear of that fleet which is superior in number, taking the advantage of the wind, or of its situation and circumstances, and tacking or veering round the van or rear of the enemy, who will thereby be exposed to great danger, and can scarcely avoid being thrown into a general confusion.

DOUBLON, or DUBLON, a Spanish and Portuguese coin, being the double of a Pistole.

DOUBTING, the act of with-holding our assent from any proposition, on suspicion that we are not thoroughly apprised of the merits thereof, or from not being able peremptorily to decide between the reasons for and against it.

Doubting is distinguished by the schoolmen into two kinds, *debitatio sterilis*, and *debitatio efficax*. The former is that where no determination ensues: in this manner the Sceptics and Academics doubt, who withhold their assent from every thing. See SCEPTICS, &c.

The latter is followed by judgment, which distinguishes truth from falsehood: such is the doubting of the Peripatetics and Cartesians. The last in particular are perpetually inculcating the deceitfulness of our senses, and tell us that we are to doubt of every one of their reports, till they have been examined and confirmed by reason. On the other hand, the Epicureans teach, that our senses always tell truth; and that, if you go ever so little from them, you come within the province of doubting. See CARTESIANS, EPICUREANS, &c.

DOUBTING, in rhetoric, a figure whereon the orator appears some time fluctuating, and undetermined

what to do or say. Tacitus furnishes us with an instance of doubting, almost to a degree of distraction, in those words of Tiberius written to the senate: *Quid scribam, P. S. aut quomodo scribam, aut quid omnino non scribam hoc tempore, dii me deaque pejus perdant quam perire quotidie sentio, si scio*.

DOUCETS, or DOUCIETS, among sportsmen, denote the testes of a deer or stag.

DOUCINE, in architecture, a moulding concave above and convex below, serving commonly as a cymatium to a delicate cornice. It is likewise called GULA.

DOVE, in ornithology. See COLUMBA.

Dove-Tailing, in carpentry, is the manner of fastening boards together by letting one piece into another, in the form of the tail of a dove. The dove-tail is the strongest of the asslages or jointings; because the tenon, or piece of wood which is put into the other, goes widening to the extreme, so that it cannot be drawn out again, by reason the extreme or tip is bigger than the hole.

DOVER, a borough and port town of England, in the county of Kent, situated in E. Long. o. 25. N. Lat. 51. 10. It sends two members to parliament, styled *barons of the Cinque-ports*, whereof Dover is the chief. Dover gave the title of duke in the Quecnberry family, but extinct: now a revived barony in the York family.

By the Romans this town was named *Dubris*, and by the Saxons *Dofra*, probably from the British word *Dour*, which signifies water. The convenience of its situation drew the attention of the Roman governors, who ruled here while they possessed this part of the island; and there still remain indubitable testimonies of their care and respect for this important place. For the defence of the town, the Romans, or, according to some, Arviragus, a British king, their confederate, by cutting out walls with infinite labour in the solid rock, constructed a stony fortress; and, as its venerable remains still prove, erected also a light-house for the benefit of navigation. The Saxons, Danes, and Normans, had a very high opinion of this place; and when the barons invited over the young prince, afterwards Louis VIII. of France, his father Philip Augustus conceived a bad opinion of the expedition, because the castle and port of Dover were held for king John, though a great part of the kingdom had submitted to Louis. In its most flourishing state, the fortress was impregnable, and the town a very opulent emporium. It had 21 wards, each of which furnished a ship for the public service, 10 gates, 7 parish churches, many religious houses, hospitals, and other public edifices. The decay of the town was brought on by that of the harbour. To recover this, Henry VIII. spent no less than 63,000*l*. in constructing piers, and 5000*l*. in building a castle between this and Folkestone, called *Sandgate*; where the shore was flat, and the landing easy. Notwithstanding all this expence, however, it was again choaked up in the reign of queen Elizabeth, by whom it was again cleared at a vast expence, so that ships of some hundred tons could enter it. Since that time it has again declined, notwithstanding of many efforts for its relief, and great assistance from time to time given by parliament for this purpose. As the haven, however,

Doucets
||
Dover.

Dover. is still capable of receiving vessels of small burden; and as the packets to France and Flanders are stationed here in time of peace, it is still a place of some consequence, and the people are active and industrious.

DOVER Straits, the narrow channel between Dover and Calais, which separates our island from the opposite continent. Britain is supposed by many to have been once peninsulated, the present straits occupying the site of the isthmus which joined it to Gaul. "No certain cause (says Mr Pennant *) can be given for the mighty convulsion which tore us from this continent; whether it was rent by an earthquake, or whether it was worn through by the continual dashing of the waters, no Pythagoras is left to solve the *Fortuna locorum* :

*Vidi ego, quod fuerat quondam sollicitissima tellus
Ej. fractum.*

* *As. B. Zool.*
Vol. I.
Introd.
p. II.

But it is most probable, that the great philosopher alluded to the partial destruction of the *Atlantica insula*, mentioned by Plato as a distant tradition in his days. It was effected by an earthquake and a deluge, which might have rent asunder the narrow isthmus in question, and left Britain, large as it seems at present, the mere wreck of its original size. The Scilly isles, the Hebrides, Orkneys, Schetlands, and perhaps the Feroe islands, may possibly be no more than fragments of the once far-extended region. I have no quarrel about the word *island*. The little isthmus, compared to the whole, might have been a junction never attended to in the limited navigations of very early times. The peninsula had never been wholly explored, and it passed with the ancients for a genuine island. The correspondence of strata on part of the opposite shores of Britain and France, leaves no room to doubt but that they were once united. The chalky cliffs of Blancenez between Calais and Bologne, and those to the westward of Dover, exactly tally: the last are vast and continued; the former short, and the termination of the immense bed. Between Bologne and Folkestone (about six miles from the latter) is another memorial of the junction of the two countries; a narrow submarine hill, called the *Rip-raps*, about a quarter of a mile broad, and ten miles long, extending eastwards towards the Goodwin Sands. Its materials are boulders, stones, adventitious to many strata. The depth of water on it, in very low spring-tides, is only fourteen feet. The fishermen from Folkestone have often touched it with a fifteen feet oar; so that it is justly the dread of navigators. Many a tall ship has perished on it, and sunk instantly into twenty-one fathoms water. In July 1782, the *Belleisle* of sixty-four guns struck, and lay on it during three hours; but, by starting her beer and water, got clear off."

These celebrated straits are only twenty-one miles wide in the narrowest part. From the pier at Dover to that at Calais is twenty-four. It is conjectured, that their breadth lessens, and that they are two miles narrower than they were in ancient times. An accurate observer of fifty years remarks to me, that the increased height of water, from a decrease of breadth, has been apparent even in that space. The depth of the channel at a medium in highest spring-tides is about twenty-five fathoms. The bottom either coarse sand or rugged scars, which have for ages unknown resisted the attrition of the currents. From the straits

both eastward and westward is a gradual increase of depth through the channel to a hundred fathoms, till soundings are totally lost or unattended to. The spring-tides in the straits rise on an average twenty-four feet, the neap-tides fifteen. The tide flows from the German sea, passes the straits, and meets, with a great rippling, the western tide from the ocean between Fairleigh near Hastings and Bologne; a proof that, if the separation of the land was effected by the seas, it must have been by the overpowering weight of those of the north.

DOVER, a town of Delaware in North America. It is the chief town of the county of Kent in the Delaware state, and is the seat of government. It stands on Jones's creek, a few miles from the Delaware river, and consists of about two houses, principally of brick. Four streets intersect each other at right angles, in the centre of the town, whose incidencies form a spacious parade, on the east side of which is an elegant state-house of brick. The town has a lively appearance, and drives on a considerable trade with Philadelphia. What is the principal article of export. The landing is five or six miles from the town of Dover.

DOUGLAS (Lord). See (*Histry of*) **SCOTLAND.**

DOUGLAS (Gavin), bishop of Dunkeld in Scotland, was the third son of Archibald earl of Angus, and born in the year 1474. Where he was educated, is not known; but it is certain that he studied theology: a study, however, which did not estrange him from the muses; for he employed himself at intervals in translating into beautiful verse the poem of Ovid de *Remedio Amoris*. The advantages of foreign travel, and the conversation of the most learned men in France and Germany, to whom his merit procured the readiest access, completed his education. With his superior recommendations and worth it was impossible he could remain unnoticed. His first preferment was to be provost of the collegiate church of St Giles in Edinburgh; a place at that time of great dignity and revenue. In the year 1514, the queen mother, then regent of Scotland, appointed Douglas abbot of Aberbrothock, and soon after archbishop of St Andrew's; but the queen's power not being sufficient to establish him in the possession of that dignity, he relinquished his claim in favour of his competitor Foreman, who was supported by the pope. In 1515, he was by the queen appointed bishop of Dunkeld; and that appointment was soon after confirmed by his holiness Leo X. Nevertheless it was some time before he could obtain peaceable possession of his see. The duke of Albany, who in this year was declared regent, opposed him because he was supported by the queen; and, in order to deprive him of his bishopric, accused him of acting contrary to law in receiving bulls from Rome. On this accusation he was committed to the castle of Edinburgh, where he continued in confinement above a year; but the regent and the queen being at last reconciled, he obtained his liberty, and was consecrated bishop of Dunkeld. In 1517, he attended the duke of Albany to France; but returned soon after to Scotland. In 1521, the disputes between the earls of Arran and Angus having thrown the kingdom into violent commotion, our prelate retired to England, where he became intimately acquainted with Polydore Virgil the historian. He

Dover,
Douglas,

Douglas,
Douw.

died in London of the plague in 1522; and was buried in the Savoy. He wrote, 1. *The Palace of Honour*: a most ingenious poem under the similitude of a vision; in which he paints the vanity and inconstancy of all worldly glory. It abounds with incidents, and a very rich vein of poetry. The palace of happiness, in the picture of Cebes, seems to be the ground-work of it. 2. *Aurea Narrationes*: a performance now lost; in which, it is said, he explained, in a most agreeable manner, the mythology of the poetical fictions of the ancients. 3. *Comedie aliquot facere*: None of which are now to be found. 4. *Thirteen Bukes of Enceades*, of the famous poet Virgil, translated out of Latin verses into Scottish metre, every buke having its particular prologue. Imprinted at London 1553, in 4to; and reprinted at Edinburgh 1710, in folio. The last is the most esteemed of all his works. He undertook it at the desire of lord Henry Sinclair, a munificent patron of arts in those times; and he completed it in 18 months; a circumstance which his admirers are too fond of repeating to his advantage. David Hume of Godscroft, an author of uncommon merit, and an admirable judge of poetry, gives the following testimony in his favour. "He wrote (says he) in his native tongue divers things; but his chiefest work is his translation of Virgil, yet extant, in verse: in which he ties himself so strictly as is possible; and yet it is so well expressed, that whosoever will essay to do the like, will find it a hard piece of work to go through with it. In his prologues before every book, where he hath his liberty, he sheweth a natural and ample vein of poetry, so pure, pleasant, and judicious, that I believe there is none that hath written before or since but cometh short of him." It has been said, that he compiled an historical treatise *De rebus Scotticis*; but no remain of it hath descended to the present times.

DOUGLAS, the principal town of the Isle of Man, and which has lately increased both in trade and buildings. The harbour, for ships of a tolerable burden, is the safest in the island, and is much mended by a fine mole that has been built. It is seated on the eastern side. W. Long. 4. 25. N. Lat. 54. 7.

DOUW (Gerhard), a celebrated painter, was born at Leyden in 1613; and received his first instructions in drawing and design from Bartholomew Dolendo an engraver, and also from Peter Kouwhoorn a painter on glass; but at the age of fifteen he became a disciple of Rembrandt. In that famous school he continued for three years; and then found himself qualified to study nature, the most unerring director.

From Rembrandt he learned the true principles of colouring, and obtained a complete knowledge of the chiaro-scuro; but to that knowledge he added a delicacy of pencil, and a patience in working up his colours to the highest degree of neatness, superior to any other master. He therefore was more pleased with those pictures of Rembrandt which were painted in his youth than those by which he was distinguished in his more advanced age; because the first seemed finished with more care and attention, the latter with more boldness, freedom, and negligence, which was quite opposite to the taste of Douw. But although his manner appears so different from that of his master, yet it was to Rembrandt alone that he owed all

Douw.

that excellence in colouring by which he triumphed over all the artists of his own country.

His pictures usually are of a small size, with figures so exquisitely touched, so transparent, so wonderfully delicate, as to excite astonishment as well as pleasure. He designed every object after nature, and with an exactness so singular, that each object appears as perfect as nature itself, in respect to colour, freshness, and force. His general manner of painting portraits was by the aid of a concave mirror, and sometimes by looking at the object through a frame with many exact squares of fine silk. But the latter custom is disused, as the eye of a good artist seems a more competent rule, though the use of the former is still practised by painters in miniature.

It is almost incredible what vast sums have been given and are given at this day for the pictures of Douw, even in his own country; as also in Italy and every polite part of Europe: for he was exceedingly curious in finishing them, and patiently assiduous beyond example. Of that patience Sandrart gives a strong proof in a circumstance which he mentions relative to this artist. He says, that having once, in company with Bamboccio, visited Gerhard Douw, they could not forbear to admire the prodigious neatness of a picture which he was then painting, in which they took particular notice of a broom; and expressing their surprise at the excessive neatness of the finishing that minute object, Douw told them he should spend three days more in working on that broom before he should account it entirely complete. In a family picture of Mrs Spiering, the same author says, that the lady had sat five days for the finishing one of her hands that leaned on an arm-chair. For that reason not many would sit to him for their portraits; and he therefore indulged himself mostly in works of fancy, in which he could introduce objects of still life, and employ as much time on them as suited his own inclination. Houbraken testifies, that his great patron Mr Spiering allowed him a thousand guilders a-year, and paid beside whatever he demanded for his pictures, and purchased some of them for their weight in silver; but Sandrart, with more probability, assures us, that the thousand guilders a-year were paid to Gerhard, on no other consideration than that the artist should give his benefactor the option of every picture he painted, for which he was immediately to receive the utmost of his demand. This great master died in 1674, aged 61.

Douw appears incontrovertibly to be the most wonderful in his finishing of all the Flemish masters. Every thing that came from his pencil is precious, and his colouring hath exactly the true and the lovely tints of nature; nor do his colours appear tortured, nor is their vigour lessened by his patient pencil; for, whatever pains he may have taken, there is no look of labour or stiffness; and his pictures are remarkable, not only for retaining their original lustre, but for having the same beautiful effect at a proper distance as they have when brought to the nearest view.

At Turin are several pictures by Gerhard Douw, wonderfully beautiful; especially one, of a Doctor attending a sick woman, and surveying an urinal. The execution of that painting is astonishingly fine, and although the shadows appear a little too dark, the

whole

Double
Down.

whole has an inexpressible effect. In the gallery at Florence there is a night-piece by candle-light, which is exquisitely finished; and in the same apartment, a mountebank attended by a number of figures, which it seems impossible either sufficiently to commend or to describe.

DOULEIA, Δουλεία, among the Athenians, a kind of punishment, by which the criminal was reduced into the condition of a slave. It was never inflicted upon any but the ἀτιμοί, *sejourners and freed servants*.

To DOUSE, in sea language, is to lower suddenly, or slacken; and it is applied to a sail in a squall of wind, an extended hawser, &c.

DOWAGER, DOTISSA (*q. d.* a widow endowed, or that has a jointure), a title, or addition, applied to the widows of princes, dukes, earls, and persons of high rank only.

QUEEN DOWAGER, is the widow of the king, and as such enjoys most of the privileges belonging to her as queen consort: but it is not high treason to violate her chastity or conspire her death, because the succession is not endangered thereby; but no man can marry her without special license from the king, on pain of forfeiting his lands and goods. See QUEEN.

DOWER, (Dotarium, Doarium, or Dos,) a portion of lands or tenements which a widow enjoys for term of life from her husband, in case she survives him: and which, at her death, descends to their children. But she must have been the wife of the party at the time of his decease; or not divorced a vinculo matrimonii: nor, if she has eloped from her husband, and lives with an adulterer, shall she be intitled to dower, unless her husband be voluntarily reconciled to her. The widows of traitors are also barred of their dower by 5 and 6 Ed. VI. cap. 11. but not the widows of felons. An alien cannot be endowed, unless she be queen-consort. And if a woman levies a fine with her husband, or if a common recovery be had with the husband and wife of the husband's lands, she is barred of her dower. A widow, clear of these impediments, is by law intitled to be endowed of all lands and tenements, of which her husband was seised in fee-simple or fee-tail at any time during the coverture; and of which any issue she might have had might by possibility have been heir. See JOINTURE.

DOWN, a county of Ireland in the province of Ulster, bounded on the east and south by St George's channel; on the west by the county of Armagh; and on the north by the county of Antrim. It lies opposite to the Isle of Man, Cumberland, and Westmoreland; and the north part of it fronts the Mull of Galloway in Scotland, and is about 44 miles from it. It is about 44 miles in length and 30 in breadth. It sends 14 members to parliament, two for the county, and 12 for the following boroughs, Down-Patrick, Newry, Newtown, Killeleagh, Bangor, and Hillborough.

This county is rough and full of hills, and yet the air is temperate and healthy. The soil naturally produces wood, unless constantly kept open and ploughed; and the low grounds degenerate into bogs and moss, where the drains are neglected. But by the industry of the inhabitants it produces good crops of corn, particularly oats; and, where marl is found, barley.

This last is exported from Killogg to Dublin. The staple commodity of this county is the linen manufacture.

Downs, or Down-Patrick, a town of Ireland, in the county of Down, is one of the most ancient in that kingdom. It is a market-town and a bishoprick, said to be erected in the fifth century by St Patrick, but is now united to the see of Connor. Within 200 paces of the town, on the ascent of a hill, are the ruins of an old cathedral, remarkable for the tomb of St Patrick the founder, in which they say the bodies of St Bridget and St Columb are also laid. The town, which is seated on the fourth corner of Lough Coin, now called the lake of Strangford, is adorned with several handsome public buildings. Among the hills, and in many islands, are flights of swans and other water-fowl; and the Lough abounds with salmon, mullets, and other sea-fish. About a mile from this town is St Patrick's well, which many people frequent to drink at some seasons of the year, and others to perform a penance enjoined them by the popish priests. The linen manufacture is carried on here, as it is in several places in this country. W. Long. 5. 50. N. Lat. 54. 23.

Downs, the fine feathers from the breasts of several birds, particularly of the duck kind.—That of the eider-duck (see ANAS, n^o 17.) is the most valuable. These birds pluck it from their breasts and line their nests with it. We are told that the quantity of down found in one nest more than filled the crown of an hat, yet weighed no more than three quarters of an ounce. Br. Zool.—Three pounds of this down may be compressed into a space scarce bigger than one's fist; yet is afterwards so dilatable as to fill a quilt five feet square. Salern. Orn. p. 416.—That found in the nests is most valued, and termed *fine down*; it is infinitely more elastic than that plucked from the dead bird, which is little esteemed in Iceland. The best sort is sold at 45 shillings per pound when cleaned, and at 16 when not cleaned. There are generally exported every year, on the company's account, fifteen hundred or two thousand pounds of both sorts, exclusive of what is privately exported by foreigners. In 1750 the Iceland Company sold as much in quantity of this article as amounted to three thousand seven hundred and forty-five banco-dollars, besides what was sent directly to Glückstadt.—Von Troil. p. 146.

DOWN or hair of plants. See HAIR.

DOWNETON, or DUNKTON, a borough-town of Wiltshire, five miles south of Salisbury. It sends two members to parliament.

DOWNHAM, a market-town of Norfolk, 10 miles south of Lynn, famous for its good butter; there being 1000, and sometimes 2000, firkins bought here every Monday, and sent up the river Ouse to Cambridge, from whence it is conveyed to London in the Cambridge-waggons.

DOWNS, a bank or elevation of sand, which the sea gathers and forms along its shores; and which serves it as a barrier. The word is formed from the French *dune*, of the Celtic *dun*, a "mountain." Charles de Vifch. in his *Compend. Chronolog. Exord. & Progress. Abbat. Clavij. B. Mariae, de Dunis*, says, *Vallem reperit arenarum collibus (quos incolae Duiyenen vocant) undique cinctum.*

Downs are particularly used for a famous road for

Down
Downs.

Dowry
||
Drabbing.

ships, along the eastern coast of the county of Kent, from Dover to the North Foreland; where both the outward and homeward-bound ships frequently make some stay; and squadrons of men of war rendezvous in time of war.

It affords excellent anchorage; and is defended by the castles of Deal, Dover, and Sandwich.

DOWRY, the money or fortune which the wife brings her husband in marriage: it is otherwise called *maritagium*, marriage-goods, and differs from dower. See DOWER.

DOXOLOGY, an hymn used in praise of the Almighty, distinguished by the title of *greater* and *lesser*.

The lesser doxology was anciently only a single sentence, without response, running in these words, *Glory be to the Father, and to the Son, and to the Holy Ghost, world without end, Amen.* Part of the latter clause, *As it was in the beginning, is now, and ever shall be*, was inserted some time after the first composition. Some read this ancient hymn, *Glory be to the Father, and to the Son with the Holy Ghost.* Others, *Glory be to the Father in or by the Son, and by the Holy Ghost.* This difference of expression occasioned no disputes in the church, till the rise of the Arian heresy; but when the followers of Arius began to make use of the latter as a distinguishing character of their party, it was entirely laid aside by the Catholics, and the use of it was enough to bring any one under suspicion of heterodoxy.

The doxology was used at the close of every solemn office. The western church repeated it at the end of every psalm, and the eastern church at the end of the last psalm. Many of their prayers were also concluded with it, particularly the solemn thanksgiving or consecration prayer at the eucharist. It was also the ordinary conclusion of their sermons.

The greater doxology, or angelic hymn, was likewise of great note in the ancient church. It began with these words, which the angels sung at our Saviour's birth, *Glory be to God on high, &c.* It was chiefly used in communion service, and in men's private devotions. Both the doxologies have a place in the church of England, the former being repeated after every psalm, and the latter used in the communion service.

DRABA, in botany: A genus of the *filiculosa* order, belonging to the *tetradynamia* class of plants; and in the natural method ranking under the 39th order, *Siliqueuse*. The filicula is entire, and oval oblong; with the valves a little plane, parallel to the partition: there is no style. There are six species; of which the only one worthy of notice is the *verna*, or early whitlow-grass. It hath naked stalks, with leaves a little ferrated. The blossoms are white, and at night the flowers hang down. It grows on old walls and dry banks. It is one of the earliest flowering plants we have, and is good to eat as a salad. Goats, sheep, and horses eat it; cows are not fond of it; swine refuse it.

DRABLER, in the sea-language, a small sail in a ship, which is the same to a bonnet that a bonnet is to a course, and is only used when the course and bonnet are too shoal to clothe the mast. See BONNET and COURSE.

DRABLING, in angling, is a method of catch-

ing barbel. Take a strong line of six yards; which, before you fasten it to your rod, must be put through a piece of lead, that if the fish bite, it may slip to and fro, and that the water may something move it on the ground; bait with a lobe worm well secured, and so by its motion the barbel will be enticed into the danger without suspicion. The best places are in running water near piles, or under wooden bridges, supported with oaks floated and flimy.

DRABS, in the falt-works, a kind of wooden boxes for holding the falt when taken out of the boiling pan; the bottoms of which are made shelving or inclining forwards, that the briny moisture of the falt may drain off.

DRAC, an imaginary being, much dreaded by the country people in many parts of France. The dracs are supposed to be malicious or at least trickish demons; but, which is very rare, if one of them happens to take a fancy to a man or woman, they are sure to be the better for it. They are still said to lay gold cups and rings on the surface over pits and rivers, as baits to draw women and children in; though their usual dwelling is some old empty house, whence they make excursions in human form, visible or invisible as best suits their purpose. The country folks shudder at the very name of the drac. Some are positive that they have seen him; for happy indeed is that village in which there is not a house execrated as the lurking-place of this tremendous drac.

DRACENA, in botany; a genus of the monogynia order, belonging to the hexandria class of plants. The corolla is sexpartite and erect; the filaments a little thicker about the middle; the berry trilocular and monospermous.

DRACHM, a Grecian coin, of the value of sevenpence three farthings. Drachm is also a weight used by our physicians; containing just fifty grains three scruples, or the eighth part of an ounce.

DRACO, a celebrated lawgiver of Athens. When he exercised the office of archon, he made a code of laws for the use of his citizens, which, on account of their severity, were said to be written in letters of blood. By them idleness was punished with as much severity as murder, and death was denounced against the one as well as the other. Such a code of rigorous laws gave occasion to a certain Athenian to ask of the legislator, why he was so severe in his punishments; and Draco gave for answer, that as the smallest transgression had appeared to him deserving death, he could not find any punishment more rigorous for more atrocious crimes. These laws were at first enforced, but they were often neglected on account of their extreme severity; and Solon totally abolished them, except that one which punished a murderer with death. The popularity of Draco was uncommon, but the gratitude of his admirers proved fatal to him. When once he appeared on the theatre, he was received with repeated applause; and the people, according to the custom of the Athenians, showed their respect to their lawgiver by throwing garments upon him. This was done in such profusion, that Draco was soon hid under them, and smothered by the too great veneration of his citizens. He lived about 624 years before the Christian era.

DRACO, the Dragon, in zoology, a genus belonging

Drabs
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Draco.

Draco
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Dracō-
tium.

Plare
CLXIV.

ing to the order of amphibia reptilia; the characters of which are these: it has four legs, a cylindrical tail, and two membranaceous wings, radiated like the fins of a fish, by which he is enabled to fly, but not to any great distance at a time. There are two species. 1. The volans, or flying dragon, with the wings entirely distinct from the fore-legs. It is found in Africa and the East Indies. 2. The prepos, with the wings fixed to the fore-legs. It is a native of America. They are both harmless creatures; and feed upon flies, ants, and small insects.

DRACO Volans, in meteorology, a fiery exhalation, frequent in marshy and cold countries.

It is most common in summer; and though principally seen playing near the banks of rivers, or in boggy places, yet sometimes mounts up to a considerable height in the air, to the no small terror of the amazed beholders; its appearance being that of an oblong, sometimes roundish, fiery body, with a long tail. It is entirely harmless, frequently flicking to the hands and cloaths of people without injuring them in the least.

DRACO, in astronomy, a constellation of the northern hemisphere; whose stars, according to Ptolemy, are 81; according to Tycho, 32; according to Hevelius, 42; according to Bayer, 33; and according to Mr Flamsteed, 80. See ASTRONOMY, n° 406.

DRACOCERPHALUM, *DRAGON'S HEAD*; a genus of the gymnocephala order, belonging to the didynamia class of plants. The throat of the corolla is inflated, the upper lip concave. There are 13 species, most of them herbaceous, annual, or perennial plants, from 18 inches to three feet high, garnished mostly with entire leaves, and whorled spikes of small monopetalous and ringlet flowers of a blue, white, or purple colour. They are all easily propagated by seeds, which may be sown either in the spring or autumn; and after the plants are come up they will require no other culture but to be kept clear from weeds.

DRACONARIUS, in antiquity, *DRAGON-BEARER*. Several nations, as the Persians, Parthians, Scythians, &c. bore dragons on their standards; whence the standards themselves were called *dracones*, "dragons." The Romans borrowed the same custom from the Parthians; or, as Cæsaion has it, from the Dacæ; or, as Codin, from the Assyrians.

The Roman *dracones* were figures of dragons painted in red on their flags, as appears from Ammianus Marcellinus: but among the Persians and Parthians they were like the Roman eagles, figures in full relief; so that the Romans were frequently deceived, and took them for real dragons.

The foldier who bore the dragon or standard was called by the Romans *draconarius*; and by the Greeks *δρακονταριος* and *δρακοντοφορος*; for the emperors carried the custom with them to Constantinople.

DRACONTIC MONTH, the time of one revolution of the moon from her ascending node, called *caput draconis*, to her return thither.

DRACONTIUM, *DRAGONS*: A genus of the polyandria order, belonging to the gynandria class of plants; and in the natural method ranking under the first order, *Palme*. The spathe is cymbiform, or shaped like a boat; the spadix covered all over; there is no calyx; there are five petals; the berries polypermous. There are five species, all natives of the Indies. The

only one which makes any appearance is the *pertusum*, *Dracuncul* with leaves having holes, and a climbing stalk. This is a native of most of the West India islands. It hath trailing stalks which put out roots at every joint, that fallen to the trunks of trees, walls, or any support which is near them, and thereby rise to the height of 25 or 30 feet. The leaves are placed alternately upon long footstalks: they are four or five inches long, two and an half broad; and have several oblong holes in each, which at first sight appears as if eaten by insects, but they are natural to the leaves. The flowers are produced at the top of the stalk, which always swells to a much larger size in that part than in any other: these are covered with an oblong spathe or hood of a whitish green colour, which opens longitudinally on one side, and shows the pistil, which is closely covered with flowers of a pale yellow, inclining to white. This plant is easily propagated by cuttings; which if planted in pots filled with poor sandy earth, and plunged into a hot-bed, will soon put out roots; but the plants are so tender, that they must be preserved in a stove.

DRACUNCULI, in medicine, small long worms which breed in the muscular parts of the arms and legs, called *Guinea worms*. The common way of getting out these worms is by the point of a needle; and to prevent their forming there again, the usual custom is to wash the parts with wine or vinegar, with alum, nitre, or common salt, or with a strong lixivium of oak-ashes, and afterwards anointing them with an ointment of the common kind used for scorbatic eruptions, with a small mixture of quicksilver.

DRACUNCULUS, in botany. See *ARUM*.

DRAFF, a name given in some places to the waff given to hogs, and the grains given to cows.

DRAG, in building. A door is said to *drag* when in opening or shutting it hangs or grates upon the floor.

DRAG, in sea-language, is a machine consisting of a sharp, square, iron ring, encircled with a net, and commonly used to take the wheel off from the platform or bottom of the decks.

DRAGOMAN, or *DROGMAN*, a term of general use through the East for an interpreter, whose office is to facilitate commerce between the orientals and occidentals. There are kept by the ambassadors of Christian nations residing at the Porte for this purpose.

The word is formed from the Arabic *targaman* or *targiman*, of the verb *targam*, "he has interpreted." From *dragoman* the Italians formed *dragomano*, and, with a nearer relation to its Arabic etymology, *turciman*; whence the French and our *trucheman*, as well as *dragoman* and *drogman*.

DRAGON, in astronomy. See *DRACO*.

DRAGON'S Head and Tail (*caput & cauda draconis*), are the nodes of the planets; or the two points where, in the ecliptic is intersected by the orbits of the planets, and particularly that of the moon; making with it angles of five degrees and eighteen minutes. One of these points looks northward; the moon beginning then to have northward latitude, and the other southward, where she commences south. Thus her deviation from the ecliptic fumes (according to the fancy of some) to make a figure like to that of a dragon, whose belly is where she has the greatest latitude; the inter-

Dracuncul
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Dragon.

Dragon. Section representing the head and tail, from which resemblance the denomination arises.

But note, that these points abide not always in one place, but have a motion of their own in the zodiac, and retrograde-wile 3 minutes 11 seconds *per* day; completing their circle in 18 years 225 days: so that the moon can be but twice in the ecliptic during her monthly period, but at all other times she will have a latitude or declination from the ecliptic.

It is about these points of intersection that all eclipses happen. They are usually denoted by these characters ☉ dragon's head, and ♀ dragon's tail.

DRAGON, in zoology. See **DRACO**.

Dragon's Blood, a gummi-refinous substance brought from the East Indies, either in oval drops wrapped up in flag leaves, or in large masses composed of smaller tears. It is said to be obtained from the palmijuncus draco, the calamus rotang, the dracena draco, the pterocarpus draco, and several other vegetables.

The writers on the materia medica in general give the preference to the former, though the others are not unfrequently of equal goodness. The fine dragon's blood of either sort breaks smooth, free from any visible impurities, of a dark red colour, which changes upon being powdered into an elegant bright crimson. Several artificial compositions, coloured with the true dragon's blood, or Brazil wood, are sometimes sold in the room of this commodity. Some of these dissolve like gums in water; others crackle in the fire without proving inflammable; whilst the genuine sanguis draconis readily melts and catches flame, and is not acted on by watery liquors. It totally dissolves in pure spirit, and tinges a large quantity of the menstrum of a deep red colour. It is likewise soluble in expressed oils, and gives them a red hue, less beautiful than that communicated by anchufa. This drug in substance has no sensible smell or taste; when dissolved, it discovers some degree of warmth and pungency. It is usually, but without foundation, looked upon as a gentle astringent; and sometimes directed as such in extemporaneous prescription against feminal gleets, the fluor albus, and other fluxes. In these cases, it is supposed to produce the general effects of resinous bodies, lightly incrassating the fluids, and somewhat strengthening the solids. But in the present practice it is very little used either externally or internally.

A solution of dragon's blood in spirit of wine is used for staining marble, to which it gives a red tinge, which penetrates more or less deeply according to the heat of the marble during the time of application. But as it spreads at the same time that it sinks deep, for fine designs the marble should be cold. Mr du-Fay says, that by adding pitch to this solution the colour may be rendered deeper.

DRAGON-Fish, or **Dragonet**, in ichthyology. See **CALLIONYMUS**.

DRAGON-FLY. See **LIBELLULA**.

DRAGON-Shell, in natural history, a name given by people curious in shells to a species of concamerated patella or limpet. This has a top very much bent; and is of an ash-colour on the outside, but of an elegant and bright flesh-colour within. This has been found sticking on the back of a tortoise, as the common limpets do on the sides of rocks; and some have been

found affixed to large shells of the pinna marina brought from the East Indies at different times.

DRAGONS, in botany. See **DRACONTIUM**.

DRAGONET, or **DRAGON-Fish**, in ichthyology. See **CALLIONYMUS**.

DRAGONNEE, in heraldry. A lion dragonnée is where the upper half resembles a lion, the other half going off like the hinder part of a dragon. The same may be said of any other beast as well as a lion.

DRAGOON, in military affairs, a musqueteer mounted on horseback, who sometimes fights or marches on foot, as occasion requires.

Menage derives the word *dragoon* from the Latin *dracinarium*, which in Vegetius is used to signify *soldier*. But it is more probably derived from the German *tragen* or *dragen*, which signifies to *carry*; as being infantry carried on horseback.

Dragoons are divided into brigades as the cavalry; and each regiment into troops; each troop having a captain, lieutenant, cornet, quarter-master, two sergeants, three corporals, and two drums. Some regiments have hantboys. They are very useful on any expedition that requires dispatch; for they can keep pace with the cavalry, and do the duty of infantry: they encamp generally on the wings of the army, or at the passes leading to the camp; and sometimes they are brought to cover the general's quarters: they march in the front and rear of the army.

The first regiment of dragoons raised in England was in 1681, and called the regiment of dragoons of North Britain. In battle or attacks they generally fight sword in hand after the first fire. Their arms are, a sword, firelock, and bayonet. In the French service, when the dragoons march on foot, their officers bear the pike and the sergeants the halbert, neither of which are used in the English service.

DRAGOONING, one of the methods used by Papists for converting refractory heretics, and bringing them within the pale of the true church.

The following method of dragooning the French Protestants, after the revocation of the edict of Nantes, under Louis XIV. is taken from a French piece, translated in 1686.

The troopers, soldiers, and dragoons went into the Protestants houses, where they marred and defaced their household stuff, broke their looking-glasses, and other utensils and ornaments, let their wine run about their cellars, and threw about their corn and spoiled it. And as to those things which they could not destroy in this manner, such as furniture of beds, linen, wearing apparel, plate, &c. they carried them to the market-place, and sold them to the Jesuits and other Roman catholics. By these means the Protestants in Montauban alone were, in four or five days, stripped of above a million of money. But this was not the worst.

They turned the dining-rooms of gentlemen into stables for their horses: and treated the owners of the houses where they quartered with the highest indignity and cruelty, lashing them about from one to another, day and night, without intermission, not suffering them to eat or drink; and when they began to sink under the fatigue and pains they had undergone, they laid them on a bed, and when they thought them

Dragons
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Dragon-
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Dragon-
ing. somewhat recovered, made them rise, and repeated the same tortures. When they faw the blood and sweat run down their faces and other parts of their bodies, they sluiced them with water, and putting over their heads kettle-drums, turned upside down, they made a continual din upon them till these unhappy creatures lost their senses. When one party of these tormentors were weary, they were relieved by another, who practised the same cruelties with fresh vigour.

At Negreplisse, a town near Montaubon, they hung up Isaac Favin, a Protestant citizen of that place, by his arm-pits, and tormented him a whole night, by pinching and tearing off his flesh with pinchers. They made a great fire round a boy of about 12 years old, who, with hands and eyes lifted up to heaven, cried out, "My God, help me!" And when they found the youth resolved to die rather than renounce his religion, they snatched him from the fire just as he was on the point of being burnt.

In several places the soldiers applied red-hot irons to the hands and feet of men and breasts of women. At Nantes they hung up several women and maids by their feet, and others by their arm-pits, and thus exposed them to public view stark naked. They bound to posts mothers that gave suck, and let their sucking infants lie languishing in their sight for several days and nights, crying, mourning, and gasping for life. Some they bound before a great fire, and being half roasted, let them go; a punishment worse than death. Amidst a thousand hideous cries and a thousand blasphemies, they hung up men and women by the hair, and some by their feet, on hooks in chimnies, and smoked them with wisps of wet hay till they were suffocated. They tied some under the arms with ropes, and plunged them again and again into wells; they bound others like criminals, put them to the torture, and with a funnel filled them with wine till the fumes of it took away their reason, when they made them say, they consented to be catholics. They stripped them naked, and after a thousand indignities, stuck them with pins and needles from head to foot. They cut and slashed them with knives; and sometimes with red-hot pinchers took hold of them by the nose and other parts of the body, and dragged them about the rooms till they made them promise to be catholics, or till the cries of these miserable wretches, calling upon God for help, forced them to let them go. They beat them with slaves, and thus bruised, and with broken bones, dragged them to church, where their forced presence was taken for an abjuration. In some places they tied fathers and husbands to their bed-posts, and before their eyes ravished their wives and daughters with impunity. They blew up men and women with bellows till they burst them. If any to escape these barbarities endeavoured to save themselves by flight, they pursued them into the fields and woods, where they shot at them like wild beasts, and prohibited them from departing the kingdom (a cruelty never practised by Nero or Dioclesian) upon pain of confiscation of effects, the galleys, the lash, and perpetual imprisonment; inasmuch that the prisons of the sea-port towns were crammed with men, women, and children, who endeavoured to save themselves by flight from their dreadful persecution. With these scenes of desolation and

horror, the popish clergy feasted their eyes, and made them only a matter of laughter and sport.

Though my heart akes (says the writer of the piece from which we are transferring) whilst I am relating these barbarities, yet for a perpetual memorial of the infernal cruelty practised by these monsters, I beg the reader's patience to lay before him two other instances, which, if he hath a heart like mine, he will not be able to read without watering these sheets with his tears.

"The first is of a young woman, who being brought before the council, upon refusing to abjure her religion, was ordered to prison. There they shaved her head, singed off the hair from other parts of her body; and having stripped her stark naked, led her through the streets of the city, where many a blow was given her, and stones flung at her: then they set her up to the neck in a tub full of water, where, after she had been for a while, they took her out, and put on her a shift dipt in wine, which, as it dried and stuck to her fore and bruised body, they snatched off again, and then had another ready dipped in wine to clap on her. This they repeated six times, thereby making her body exceeding raw and sore. When all these cruelties could not shake her constancy, they fastened her by her feet in a kind of gibbet, and let her hang in that posture, with her head downward, till she expired.

"The other is of a man in whose house were quartered some of these missionary dragons. One day, having drank plentifully of his wine, and broken their glasses at every health, they filled the floor with the fragments, and by often walking over them reduced them to very small pieces. This done, in the insolence of their mirth, they resolved on a dance, and told their Protestant host that he must be one of their company; but as he would not be of their religion, he must dance quite barefoot; and thus barefoot they drove him about the room, treading on the sharp points of the broken glasses. When he was no longer able to stand, they laid him on a bed, and, in a short time, stripped him stark naked, and rolled him from one end of the room to the other, till every part of his body was full of the fragments of glass. After this they dragged him to his bed, and having sent for a surgeon, obliged him to cut out the pieces of glass with his instruments, thereby putting him to the most exquisite and horrible pains that can possibly be conceived.

"These, fellow Protestants, were the methods used by the most Christian king's apostolic dragons to convert his heretical subjects to the Roman catholic faith! These, and many other of the like nature, were the torments to which Louis XIV. delivered them over to bring them to his own church! and as popery is unchangeably the same, these are the tortures prepared for you, if ever that religion should be permitted to become settled amongst you; the consideration of which made Luther say of it, what every man that knows any thing of Christianity must agree with him in, 'If you had no other reason to go out of the Roman church, this alone would suffice, that you see and hear, how, contrary to the law of God, they shed innocent blood. This single circumstance shall, God willing, ever separate me from the papacy. And if I was now subject to it, and could blame nothing in any of their doctrines; yet for this crime

Dragon-
ing.

Drags,
Drains.

of cruelty, I would fly from his communion, as from a den of thieves and murderers."

DRAGS, in the sea-language, are whatever hangs over the ship in the sea, as shirts, coats, or the like; and boats, when towed, or whatever else that after this manner may hinder the ship's way when the sails, are called *drags*.

DRAINS, a name given, in the fen countries, to certain large cuts or ditches of 20, 30, nay sometimes 40 feet wide, carried through the marshy ground to some river or other place capable of discharging the water they carry out of the fen-lands.

An effectual method of drawing off the water from such grounds as are hurt by springs oozing out upon them (usually distinguished by the name of *wet* or *spouting* ground, or *bogs*), has been a desideratum in agriculture. Mr Anderson is almost the only person who hath treated this matter scientifically, and his observations have to be very rational and well founded.

"Springs (says he) are formed in the bowels of the earth, by water percolating through the upper strata where that is of a porous texture, which continues to descend downwards till it meets with a stratum of clay that intercepts it in its course; where, being collected in considerable quantities, it is forced to seek a passage through the porous strata of sand, gravel, or rock, that may be above the clay, following the course of these strata till they approach the surface of the earth, or are interrupted by any obstacle which occasions the water to rise upwards, forming springs, bogs, and the other phenomena of this nature; which being variously diversified in different circumstances, produce that variety of appearances in this respect that we often meet with.

"This being the case, we may naturally conclude, that an abundant spring need never be expected in any country that is covered to a great depth with sand without any stratum of clay to force it upwards, as is the case in the sandy deserts of Arabia, and the immeasurable plains of Libya: neither are we to expect abundant springs in any soil that consists of an uniform bed of clay from the surface to a great depth; for it must always be in some porous stratum that the water flows in abundance; and it can be made to flow horizontally in that, only when it is supported by a stratum of clay, or other substance that is equally impermeable by water. Hence the *rationale* of that rule so universally established in digging for wells, that if you begin with sand or gravel, &c. you need seldom hope to find water till you come to clay; and if you begin with clay, you can hope for none in abundance till you reach to sand, gravel, or rock.

"It is necessary that the farmer should attend to this process of nature with care, as his success in draining bogs, and every species of damp and spouting ground, will in a great measure depend upon his thorough knowledge of this,—his acuteness in perceiving in every case the variations that may be occasioned by particular circumstances, and his skill in varying the plan of his operations according to these. As the variety of cases that may occur in this respect is very great, it would be a very tedious task to enumerate the whole, and describe the particular method of treating each; I shall therefore content myself with enumerating a few particular cases, to show in what manner

the principles above established may be applied to practice.

"Let fig. 1. represent a perpendicular section of a part of the earth, in which AB is the surface of the ground, beneath which are several strata of porous substances which allow the water to sink through them till it reaches the line CD, that is supposed to represent the upper surface of a solid bed of clay; above which lies a stratum of rock, sand, or gravel. In this case, it is plain, that when the water reaches the bed of clay, and can sink no farther, it must be there accumulated into a body; and seeking for itself a passage, it flows along the surface of the clay, among the sand or gravel, from D towards C; till at last it issues forth, at the opening A, a spring of pure water.

"If the quantity of water that is accumulated between D and C is not very considerable, and the stratum of clay approaches near the surface; in that case, the whole of it will issue by the opening at A, and the ground will remain dry both above and below it. But, if the quantity of water is so great as to raise it to a considerable height in the bed of sand or gravel, and if that stratum of sand is not discontinued before it reaches the surface of the ground, the water, in this case, would not only issue at A, but would likewise ooze out in small streams thro' every part of the ground between A and a; forming a barren patch of wet sandy or gravelly ground upon the side of a declivity, which every attentive observer must have frequently met with.

"To drain a piece of ground in this situation is perhaps the most unprofitable task that a farmer can engage in; not only because it is difficult to execute, but also because the soil that is gained is but of very little value. However, it is lucky that patches of this kind are seldom of great breadth, although they sometimes run along the side of a declivity in a horizontal direction for a great length. The only effectual method of draining this kind of ground, is to open a ditch as high up as the highest of the springs at a, which should be of such a depth as not only to penetrate through the whole bed of sand or gravel, but also to sink so far into the bed of clay below, as to make a canal therein sufficiently large to contain and carry off the whole of the water. Such a ditch is represented by the dotted lines *aee*: but as the expence of making a ditch of such a depth as this would suppose, and of keeping it afterwards in repair, is very great, it is but in very few cases that this mode of draining would be advisable; and never, unless where the declivity happens to be so small, as that a great surface is lost for little depth, as would have been the case here if the surface had extended in the direction of the dotted line *a d*.

"But supposing that the stratum of clay, after approaching toward the surface at A, continued to keep at a little depth below ground; and that the soil which lay above it was of a sandy or spungy nature, so as to allow the water to penetrate it easily; even supposing the quantity of water that flowed from D to C was but very inconsiderable, instead of rising out at the spring A, it would flow forward along the surface of the clay among the porous earth that forms the soil, so as to keep it constantly drenched with water, and of consequence render it of very little value.

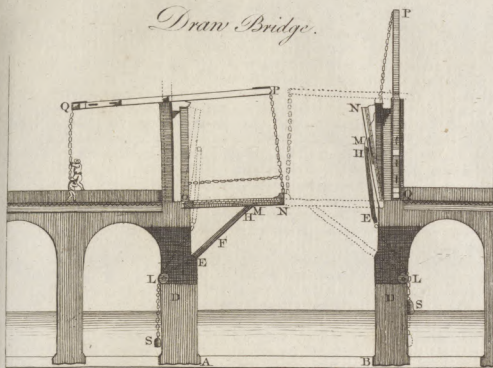
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Drains.

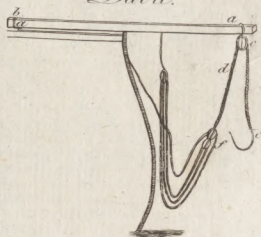
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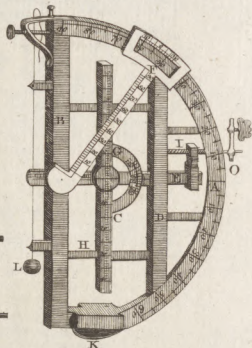
Draw Bridge.



Davit.



Dendrometer, N^o 1.



A Dun or Burgh.



N^o 2.

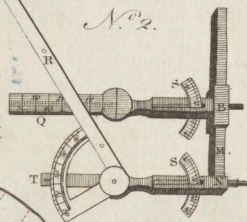
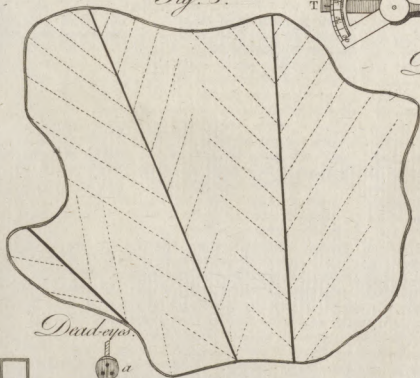


Fig. 5.



Drains.



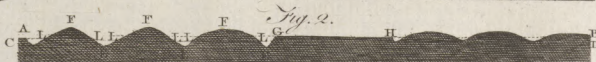
Fig. 3.



Fig. 1.

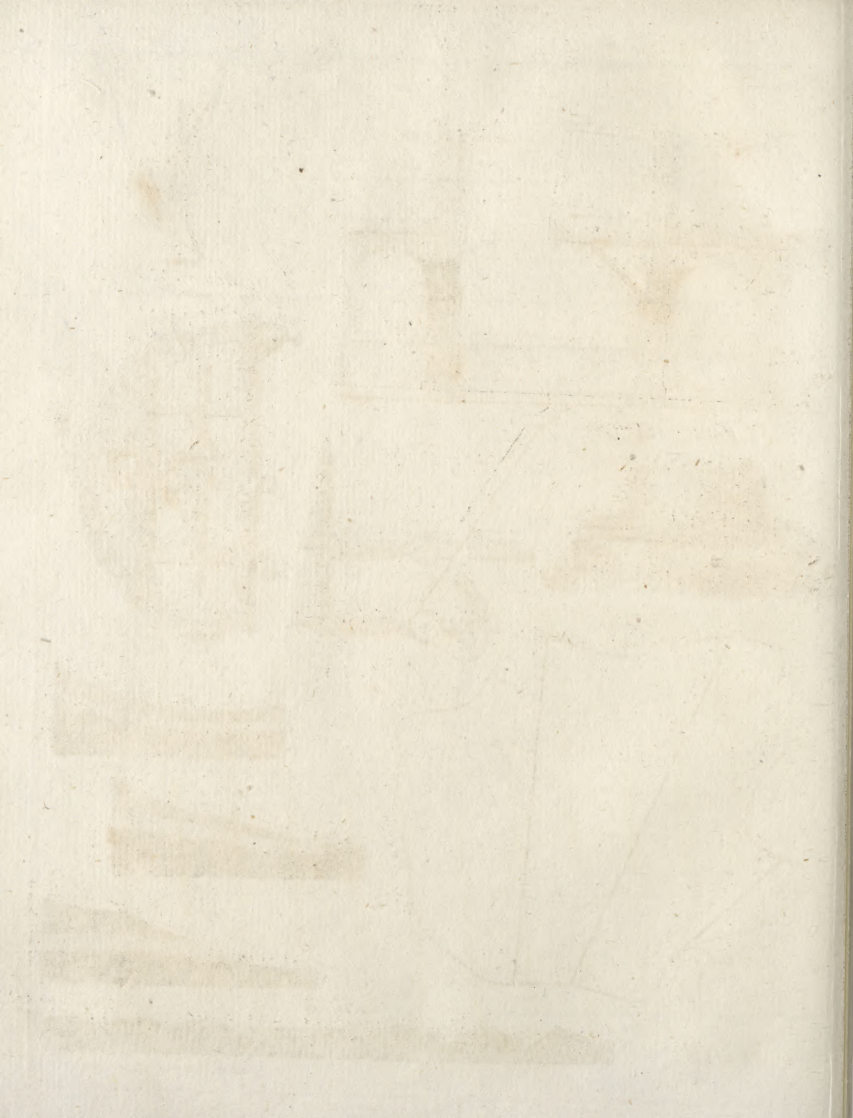


Fig. 2.



Abell Prim. Nat. Sculptor fecit.





Drains.

"Wetnels arising from this cause, is usually of much greater extent than the former: and, as it admits of an easy cure, it ought not to be one moment delayed; as a ditch of a very moderate depth opened at A, and carried through a part of the fratum of clay (as represented by the dotted lines A *k* f), would intercept and carry off the whole of the water, and render the field as dry as could be desired. It is, therefore, of very great consequence to the farmer, accurately to distinguish between these two cases, so nearly allied to each other in appearance; and, as this can be easiest done by boring, every one who has much ground of this kind ought to provide himself with a set of boring-irons, which he will likewise find use for on other occasions.

"I might here enumerate a great variety of cases which might be reduced to the same head with the foregoing: but as any attentive reader may, after what has been said, be able easily to distinguish these, I shall only in general observe, that every soil of a soft and porous texture, that lies upon a bed of hard clay, whatever its situation in other respects may be, will in some measure be subjected to this disease. And if it is upon a declivity of any considerable length, the undermoit parts of the field will be much damaged by it, unless ditches are thrown up across the declivity at proper distances from one another, to intercept the water in its descent.

"It may not likewise be improper here to observe, that in cases of this nature, unless where the soil is of a very great depth, the malady will always be increased, by raising the ridges to a considerable height; as will appear evident by examining fig. 2. in which the line A B represents the surface of a field of this nature, and C D the surface of the bed of clay. Now, if this field were raised into high ridges, as at F F F, so that the furrows E E E descended below the surface of the clay, it is plain, that all the water that should sink through the middle of the ridge, would run along the surface of the clay till it came to the sides of the ridge L L L L L L, which would thus be kept continually soaked with water. Whereas, if the ground had been kept level, as in the part of the field from G to H, with open furrows H, at moderate distances from each other, the water would immediately sink to the clay, and be carried off by the furrows, so as to damage the soil far less than when the ridges are high. If the soil is so thin as that the plough can always touch the clay, the ridges ought to be made narrow and quite flat, as from G to H: but if there is a little greater depth of soil, then it ought to be raised into ridges of a moderate height, as from H to B, so as to allow the bottom of the furrow to reach the clay: but neither is this necessary where the soil is of any considerable depth.

"I have seen some industrious farmers, who having ground in this situation, have been at the very great expence of making a covered drain in each furrow. But, had they rightly understood the nature of the disease, they never would have thought of applying such a remedy; as must appear evident at first sight to those who examine the figure. The success was what might be expected from such a foolish undertaking.

"These observations, it is hoped, will be sufficient as to the manner of treating wet, sandy, or porous soils.

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Drains.

I now proceed to take notice of such as are of a stiff clayey nature, which are often very different in appearance, and require a different treatment from these.

"Suppose that (in fig. 3.) the fratum of sand or gravel D C should be discontinued, as at E, and that the fratum above it should be of a coherent clayey nature. In this case, the water that flowed towards E, being there pent in on every side, and being accumulated there in great quantities, it must at length force a passage for itself in some way; and pressing strongly upon the upper surface, if any one part is weaker than the rest, it there would burst forth and form a spring, (as suppose at A). But if the texture of every part of this fratum were equally strong, the water would squeeze thro' many small crannies, and would ooze out in numberless places, as between A and F, so as to occasion that kind of wetnels that is known by the name of a *spouting clayey soil*.

"The cure, in this case, is much more easily effected than in any of the former; for if a ditch of a considerable size is opened, as at A, towards the lowermost side of the spouting ground, so deep as to penetrate through the upper fratum of clay, and reach to the gravel, the water will rise up through it at first with very great violence, which will gradually decrease as the pressure from the water behind is diminished; and when the whole of the water accumulated in this subterraneous reservoir is run off, there being no longer any pressure upon the clay above it, the whole soon becomes as dry as could be desired, and continues so ever afterwards, if the ditch is always kept open. This I speak from experience, I having rendered some fields of this kind that were very wet, quite dry by this method of treating them.

"It will hardly be necessary for me here to put the farmer upon his guard, to be particularly careful in his observations, that he may distinguish between the wetnels that is produced from this cause, and that which proceeds from the cause before mentioned; because the treatment that would cure the one would be of no use at all to the other. The attentive observer likewise will readily perceive, that if any field that is wet from this cause admits of being ploughed, it will be in equal danger of being hurt by being raised into high ridges, with the other kind of damp ground before mentioned. For as the depth of earth above the reservoir would be smaller in the deep furrows than any where else, there would, of consequence, be less resistance to the water in that place, so that it would rise there in greater abundance. And if, in this case, a farmer should dig a drain in each furrow, as a considerable quantity of water would rise into them, in some cases, the ground might be improved, or even quite drained thereby, especially if they should have accidentally reached the gravel in any one place; although at an expence much greater than was necessary. I take notice of this circumstance in some measure to prevent the prejudice that some inattentive observers might entertain against what was said before of this method of draining, from their having accidentally seen some fields that may have been bettered by it.

"Bogs are only a variety of this last-mentioned kind of wet ground; and, therefore, ought in general to be drained after the same manner with them. Clay is a substance that strongly resists the entrance of water

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into it : but when it is long drenched with it, it is, in process of time, in some measure dissolved thereby ; loses its original firmness of texture and confidence ; and becomes a sort of semi-fluid mass, which is called a *bog* ; and as these are sometimes covered with a strong scurf of a particular kind of grass, with very matted roots, which is strong enough to bear a small weight without breaking, although it yields very much, it is in these circumstances called a *swaggle*. But, whatever be the nature of the bog, it is invariably occasioned by water being forced up through a bed of clay, as just now described, and dissolving or softening, if you will, a part thereof. I say only a part ; because whatever may be the depth of the bog or swaggle, it generally has a partition of solid clay between it and the reservoir of water under it, from whence it originally proceeds : for if this were not the case, and the quantity of water were considerable, it would meet with no sufficient resistance from the bog, and would issue through it with violence, and carry the whole semi-fluid mass along with it. But this would more inevitably be the case, if there was a crust at the bottom of the bog, and if that crust should ever be broken, especially if the quantity of water under it were very considerable : and as it is probable, that, in many cases of this sort, the water slowly dissolves more and more of this under-crust, I make no doubt, but that, in the revolution of many ages, a great many eruptions of this kind may have happened, although they may not have been deemed of importance enough to have the history of them transmitted to posterity. Of this kind, although formed of a different substance, I consider the flow of the Solway-moors in Northumberland to have been ; which, upon the 16th of November 1771, burst its former boundaries, and poured forth a prodigious stream of semi-fluid matter, which in a short time covered several hundred acres of very fine arable ground. Nor will any one, who is acquainted with the nature of moss,—who knows its resemblance to clay in its quality of absorbing and retaining water, and its very easy diffusibility therein, be surpris'd at this ; as, from all these properties, it is much better adapted for forming an extensive bog, and therefore in greater danger of producing an extensive desolation by an eruption of the water into it, than those that are formed of any kind of clay whatever.

Fig. 4.

If the bog, or swampy ground, is upon a declivity, the ditch ought to be carried across the field about the place where the lowest springs arise. But if the surface of the ground is level or nearly so, as between A and B, and the springs break out in several places, *gggggg*, so as to form soft quagmires interperfed through the whole of the field, it will be of little consequence in what part the drain is opened ; for if it is dug up so deep as to allow the water to rise in it with freedom, it will issue through that opening, and the field will be left perfectly dry.

“ But as it may frequently happen that the stratum of gravel should be at a considerable depth beneath the surface of the earth, and as it may be sometimes even below the level of the place into which the drain must be emptied, it might sometimes be extremely difficult to make a ditch so deep as to reach the bed of sand or gravel. But it is lucky for us that this is not absolutely necessary in the present case ; as a drain

of two or three feet deep, as at D, will be equally effectual with one that should go to the gravel. All that is necessary in this case, is to sink pits (P) in the course of the drain, at a moderate distance from one another, which go so deep as to reach the gravel ; for as the water there meets with no resistance, it readily flows out at these openings, and is carried off by the drain without being forced up through the earth ; so that the ground is left entirely dry ever after.

“ I have likewise drained several fields in this way ; and as I have generally found the appearances pretty much alike, I shall, for the information of the inexperienced reader, give a short account of them.

“ If you attempt to make your pit in one of these soft quaggy places where the water is found in great abundance, you will meet with very great difficulty in forming it ; for as the substance of which it is composed is soft, it will always flow into the hole as fast as you dig it ; on which account I would advise, not to attempt to make the pit in the swaggle, but as near it in the solid earth as you conveniently can. However, if it is pretty firm, and of no great extent, it is sometimes practicable to make a pit in the soft bog at the driest time of the year. This I have sometimes practised, which gave me an opportunity of observing the nature of these bogs more perfectly than I otherwise would have had. In the trials of this kind that I have made, this soft quaggy ground has seldom been above three or four feet deep, below which I have always found a stratum of hard tough clay usually mixed with stones ; and so firm, that nothing but a mattock or pick-axe could penetrate it : and as this is comparatively so much drier than the ground above it, an inexperienced operator is very apt to imagine that this is the bottom that he is in search of. In digging thro' this stratum, you will frequently meet with small springs oozing out in all directions ; some of them that might fill the tube of a small quill, and others so small as to be scarce perceptible : but without regarding these, you must continue to dig on without intermission till you come to the main body of the reservoir, if I may so call it, that is contained in the rock, gravel, or sand ; which you will generally find from two to four feet below the bottom of the swaggle, and which you will be in no danger of mistaking when you come to it : for, if there has been no opening made before that in the field, as soon as you break the crust immediately above the gravel or rock, the water bursts forth like a torrent, and on some occasions rises like a *jet d'eau*, to a considerable height above the bottom of the ditch ; and continues to flow off with great impetuosity for some time, till the pent-up water being drained off, the violent boiling up begins to subside, and the strength of the current to abate ; and, in a short time, it flows gently out like any ordinary spring ;—allowing it to remain in this state, the quaggy earth begins to subside, and gradually becomes firmer and firmer every day ; so that, in the space of a few months, those bogs which were formerly so soft as hardly to support the weight of a small dog, become so firm, that oxen and horses may tread upon them without any danger of sinking, at the very wettest season of the year. I have had a field of this nature, that, by having only one such pit as I have now described opened in it, was entirely drained to the distance of above a hundred

Drains.

Drains.

yards around it in every direction. But as it is possible that the stratum in which the water runs may be in some places interrupted, it will be in general expedient to make several of these pits, if the field is of great extent ; always carrying the drain forward thro' the lowermost part of the field, or as near the quag as you conveniently can ; and sinking a pit wherever you may judge it will be most necessary. But if the stratum of gravel is not interrupted, there will be no violent burst of water at opening any of these after the first, as I have frequently experienced. To keep these wells from closing up after they are made, it is always expedient to fill them up with small stones immediately after they are made, which ought to rise to the height of the bottom of the drain.

" I have often imagined that the expence of digging these pits might be saved by boring a hole through this solid stratum of clay with a large wimble made on purpose ; but as I never experienced this, I cannot say whether or not it would answer the desired end exactly.

" If the whole field that is to be drained consists of one extensive bog, it will require a long time before the whole work can be entirely finished, as it will be impossible to open a drain through it till one part of it is first drained and becomes solid ground. In a situation of this kind, the undertaker, after having opened a drain to convey the water from the lowest part of the bog, must approach as near to the swampy ground as he can, and there make his first pit ; which will drain off the water from the nearest parts of the bog. When this has continued open for some time, and that part of the bog is become so solid as to admit of being worked, let him continue the ditch as far forward thro' it as the situation it is in will admit of, and there sink another pit ; and proceed gradually forward in the same manner ; making cross cuts where necessary, till the whole be finished.

" In this manner may any bog or track of spouting ground of this nature be rendered dry at a very inconsiderable expence ; and as there can be no other method of draining ground of this sort effectually, I recommend the study of it to the attention of every diligent farmer who may have occasion for it. Let him first be extremely cautious in examining all the circumstances of his particular fields, that he may be certain which of the classes above enumerated it may be ranked with ; and, when he is perfectly sure of that, he may proceed without fear, being morally certain of success.

" There is, however, one kind of damp ground not yet particularly specified, that I have purposely omitted taking notice of till this time, as I have never had any opportunity of examining particularly into the nature of it, nor of ascertaining by experience what is the most proper method of treating it.—The soil I have now particularly in my eye consists of a deep strong clay that does not vary its nature even on the surface, but in as far as manures may have rendered it more friable and tender: the colour usually inclines to a reddish cast, and, for the most part, it is situated upon the side of some declivity. This bed of clay reaches to a great depth, without any variation, and is intermixed with a considerable quantity of small round stones. Many soils of the sort now described, are apt to be continually

moist and full of water during the winter season ; but when the dry weather of summer sets in, the moisture is diminished, and the surface becomes hard, and it is rent into many large gaps which allow free admission to the sun and air, so as to scorch up almost every plant that is sowed upon it : and as these soils are usually in themselves naturally fertile when drained, it were to be wished that some method could be discovered that would be less expensive than what is usually practised with regard to some soils of this kind in Essex ; where they make covered drains of two and a half feet deep, running diagonally through the whole field, at the distance of 20 feet from each other."

Concerning the making of these drains we have the following directions in the Georgical Essays, by T. B. Bayley, Esq; of Hope near Manchester.—" First make the main drains down the slope or fall of the field. When the land is very wet, or has not much fall, there should, in general, be two of these to a statute acre ; for the shorter the narrow drains are, the less liable they will be to accidents. The width of the trench for the main drains should be 30 inches at top, but the width at the bottom must be regulated by the nature and size of the materials intended to be used. If the drain is to be made of bricks 10 inches long, 3 inches thick, and 4 inches in breadth, then the bottom of the drain must be 12 inches ; but if the common sale bricks are used, then the bottom must be proportionably contracted. In both cases there must be an interstice of one inch between the bottom brick and the sides of the trench, and the vacancy must be filled up with straw, rushes, or loose mould. For the purpose of making these drains, I order my bricks to be moulded 10 inches long, 4 broad, and 3 thick ; which dimensions always make the best drain.

" The method I pursue in constructing my main drains is as follows.—When the ground is soft and spongy, the bottom of the drain is laid with bricks placed across. On these, on each side, two bricks are laid flat, one upon the other, forming a drain six inches high and four broad ; which is covered with bricks laid flat. When the bottom of the trench is found to be a firm and solid body, as clay or marl, the bottom of the drain does not then require being laid with bricks. In that case the sides are formed by placing one brick edgewise, instead of two laid flat.

" This latter method is much cheaper, and in such land equally durable with the other. When stones are used instead of bricks, the bottom of the drain should be about eight inches in width. And here it will be proper to remark, that, in all cases, the bottom of the main drains must be sunk four inches below the level of the narrow ones, even at the point where the latter fall into them.

" The main drains should be kept open till the narrow ones are begun from them, after which they may be finished ; but before the earth is returned upon the stones or bricks, it will be advisable to throw in straw, rushes, or brush-wood, to increase the freedom of the drain.

" The small narrow drains should be cut at the distance of 16 or 18 feet from each other ; and should fall into the main drain at very acute angles, to prevent any stoppage. At the point where they fall in, and eight or ten inches above it, they should be made

Drains.

Drake.

Plate
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firm with brick or stone. These drains should be 18 inches wide at top, and 16 at bottom."—Fig. 5, represents a field with drains laid out according to Mr Bayley's method. The black lines represent the main drains, and the dotted lines represent the narrow drains communicating with the former from all parts of the field.

DRAKE, in ornithology, the male of the duck kind. See ANAS.

DRAKE (Sir Francis), the renowned English admiral, was the son of Edmund Drake a sailor, and born near Tavistock in Devonshire, in the year 1545. He was brought up at the expence and under the care of Sir John Hawkins, who was his kinsman; and, at the age of 18, was purser of a ship trading to Biscay. At 20, he made a voyage to Guinea; and, at 22, had the honour to be made captain of the Judith. In that capacity he was in the harbour of St John de Ulloa, in the gulph of Mexico, where he behaved most gallantly in the glorious actions under Sir John Hawkins, and returned with him to England with great reputation, though not worth a groat. Upon this he projected a design against the Spaniards in the West Indies; which he no sooner published, than he had volunteers enough ready to accompany him. In 1570, he made his first expedition with two ships; and the next year with one only, in which he returned safe, if not with such advantages as he expected. He made another expedition in 1572, wherein he did the Spaniards some mischief, and gained considerable booties. In these expeditions he was much assisted by a nation of Indians, who then were, and have been ever since, engaged in perpetual wars with the Spaniards. The prince of these people was named *Pedro*; to whom Drake presented a fine cutlass from his side, which he saw the Indian greatly admired. Pedro, in return, gave him four large wedges of gold; which Drake threw into the common stock, saying, That he thought it but just that such as bore the charge of so uncertain a voyage on his credit, should share the utmost advantage that voyage produced. Then, embarking his men with all the wealth he had obtained, which was very considerable, he bore away for England, where he arrived in August 1573.

His success in this expedition, joined to his honourable behaviour towards his owners, gained him a high reputation; and the use he made of his riches, a still greater. For, fitting out three stout frigates at his own expence, he sailed with them to Ireland; where, under Walter earl of Essex, the father of the famous unfortunate earl, he served as a volunteer, and did many glorious actions. After the death of his noble patron, he returned into England; where Sir Christopher Hatton introduced him to her majesty, and procured him countenance and protection at court. By this means he acquired a capacity of undertaking that grand expedition which will render his name immortal. The first thing he proposed was a voyage into the South Seas through the Straits of Magellan; which was what hitherto no Englishman had ever attempted. The project was well received at court: the queen furnished him with means; and his own fame quickly drew together a sufficient force. The fleet with which he sailed on this extraordinary undertaking, consisted only of five vessels, small when compared with modern ships,

and no more than 164 able men. He sailed on the 13th of December 1577; on the 25th fell in with the coast of Barbary, and on the 29th with cape Verd. On the 13th of March he passed the equinoctial, made the coast of Brazil on the 5th of April, and entered the River de la Plata, where he lost the company of two of his ships; but meeting them again, and taking out their provisions, he turned them adrift. On the 29th of May he entered the port of St Julian's, where he continued two months for the sake of laying in provisions: on the 20th of August he entered the Straits of Magellan, and on the 25th of September passed them, having then only his own ship. On the 25th of November he came to Maclao, which he had appointed for a place of rendezvous in case his ships separated; but captain Winter, his vice admiral, having repassed the Straits, was returned to England. Thence he continued his voyage along the coasts of Chili and Peru, taking all opportunities of seizing Spanish ships, and attacking them on shore, till his men were fatigued with plunder; and then, coasting America to the height of 48 degrees, he endeavoured to find a passage that way back into our seas, but could not. However, he landed, and called the country *New Allion*, taking possession of it in the name and for the use of queen Elizabeth; and, having careened his ship, set sail from thence, on the 29th of September 1579, for the Moluccas. He is supposed to have chosen this passage round, partly to avoid being attacked by the Spaniards at a disadvantage, and partly from the lateness of the season, whence dangerous storms and hurricanes were apprehended. On the 13th of October he fell in with certain islands inhabited by the most barbarous people he had met with in all his voyage: on the 4th of November he had fight of the Moluccas; and, coming to Ternate, was extremely well received by the king thereof, who appears, from the most authentic relations of this voyage, to have been a wise and polite prince. On the 10th of December he made Celebes; where his ship unfortunately ran upon a rock, the 9th of January following; from which, beyond all expectation, and in a manner miraculously, they got off, and continued their course. On the 16th of March he arrived at Java Major; and from thence he intended to have directed his course to Malacca; but found himself obliged to alter his purpose, and to think of returning home. On the 25th of March 1580, he put this design in execution; and on the 15th of June he doubled the Cape of Good Hope, having then on board 57 men, and but three casks of water. On the 12th of July he passed the line, reached the coast of Guinea on the 16th, and there watered. On the 11th of September he made the island of Tercera; and on the 3d of November entered the harbour of Plymouth. This voyage round the world was performed in two years and about ten months. Shortly after his arrival, the queen going to Deptford, went on board his ship; where, after dinner, she conferred on him the order of knighthood, and declared her absolute approbation of all he had done. She likewise gave directions for the preservation of his ship, that it might remain a monument of his own and his country's glory. This celebrated ship, which had been contemplated many years at Deptford, at length decaying, it was broke up, and a chair, made out of the planks, was presented to the university of Oxford; upon

Drake.

Drake. on which the famous Abraham Cowley made the following verses:

- " To this great ship, which round the world has run,
- " And match'd in race the chariot of the fun;
- " This Pythagorean ship (for it may claim,
- " Without presumption, so deriv'd a name,
- " By knowledge once, and transformation now)
- " In her new shape this sacred port allow.
- " Drake and his ship could not have with'd, from fate,
- " An happier station, or more blest'd estate:
- " For, lo! a seat of enliven'd life is given,
- " To her in Oxford, and to him in heaven.

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In the year 1585, he sailed with a fleet to the West Indies; and took the cities of St Jago, St Domingo, Carthagena, and St Augustin. In 1587, he went to Lisbon with a fleet of 30 sail; and having intelligence of a great fleet assembled in the bay of Cadiz, which was to have made part of the armada, he with great courage entered that port, and burnt there upwards of 10,000 tons of shipping: which he afterwards merrily called *burning the king of Spain's beard*. In 1588, when the armada from Spain was approaching our coasts, Sir Francis Drake was appointed vice-admiral under Charles lord Howard of Effingham, high admiral of England, where fortune favoured him as remarkably as ever: for he made prize of a very large galleon, commanded by Don Pedro de Valdez, who was reputed the projector of this invasion. This affair happened in the following manner: On the 22d of July, Sir Francis observing a great Spanish ship floating at a distance from both fleets, sent his pinnace to summon the commander to yield. Valdez replied, with much Spanish solemnity, that they were 450 strong; that he himself was Don Pedro, and stood much upon his honour; and thereupon propounded several conditions, upon which he was willing to yield. But the vice-admiral replied, That he had no leisure to parley: but if he thought fit instantly to yield, he might; if not, he should soon find that Drake was no coward. Pedro, hearing the name of Drake, immediately yielded, and with 46 of his attendants came on board Drake's ship. This Don Pedro remained about two years Sir Francis Drake's prisoner in England; and, when he was released, paid him for his own and his captains liberties, a ransom of 3500l. Drake's soldiers were well recompensed with the plunder of this ship; for they found in it 55,000 ducats of gold, which was divided among them.

A little before this formidable Spanish armament put to sea, the ambassador of his Catholic majesty had the confidence to propound to queen Elizabeth, in Latin verse, the terms upon which the might hope for peace; which, with an English translation by Dr Fuller, we will insert in this place, because Drake's expedition to the West Indies makes a part of this message. The verses are these:

*Te ceto ne pergis bello defendere Belgis:
Sic te Dracus crispus nunc resistitur apertis:
Quas gates evortit juba-ti-tondere collis:
Religio Pope saci resistitur ad ungues.*

- " These to you are our commands,
- " Send no help to th' Netherlands:
- " Of the treasure took by Drake,
- " Restitution you must make:
- " And these abbies build anew,
- " Which your father, overthrew:

" If for any peace you hope,
" In all points restore the pope."

The queen's extempore return:

- Ad Græci, bene rex, sent mandata hælodati.*
- " Worthy king, know, this your will
- " At Latter-Lammas we'll fulfil.

In the year 1589, Sir Francis Drake commanded as admiral the fleet sent to restore Don Antonio king of Portugal, the command of the land-forces being given to Sir John Norris: but they were hardly got to sea, before the commanders differed, and so the attempt proved abortive. The war with Spain continuing, a more effectual expedition was undertaken by Sir John Hawkins and Sir Francis Drake, against their settlements in the West Indies, than had hitherto been made during the whole course of it: but the commanders here again not agreeing about the plan, this also did not turn out so successfully as was expected. All difficulties, before these two last expeditions, had given way to the skill and fortune of Sir Francis Drake; which probably was the reason why he did not bear these disappointments so well as he otherwise would have done. A strong sense of them is supposed to have thrown him into a melancholy, which occasioned a bloody flux; and of this he died on board his own ship, near the town of Nombre de Dios in the West Indies, on the 28th of January 1595-6. His death was lamented by the whole nation, and particularly by his countrymen; who had great reason to love him from the circumstances of his private life, as well as to esteem him in his public character. He was elected burgeis for the town of Bosciney, alias Tintagel, in the county of Cornwall, in the 27th parliament of queen Elizabeth; and for Plymouth in Devonshire, in the 35th of the same reign. This town had very particular obligations to him: for, in the year 1587, he undertook to bring water into it, through the want of which, till then, it had been grievously distressed; and he performed it by conducting thither a stream from springs at eight miles distance, that is to say, in a straight line: for in the manner he brought it, the course of it runs upwards of 20 miles.

DRAKENBORCH: (Arnold), professor of eloquence and history at Utrecht, made himself known by several works, and particularly by his Notes on Titus Livius and Silius Italicus; his fine editions of which are highly esteemed.

DRAMA, a poem containing some certain action, and representing a true picture of human life, for the delight and improvement of mankind.

The principal species of the drama are two, comedy and tragedy. Some others there are of less note, as pastoral, satire, tragi-comedy, opera, &c. See the article **POETRY**.

DRAMATIC, an epithet given to pieces written for the stage. See **POETRY**.

DRANK, among farmers, a term used to denote wild oats, which never fail to infect worn-out lands; so that, when ploughed lands run to these weeds and thistles, the farmer knows it is high time to follow them, or else to sow them with hay-seed, and make pasture of them.

DRAPERY, in sculpture and painting, signifies the representation of the clothing of human figures, and also hangings, tapestry, curtains, and most other things that

Drake.

Draper.

Draper.

Draper.

Drastic.
||
Drawback.

that are not carnations or landscapes. See PAINFING, CRAYON, DRAWING, and MINIATURE.

DRASTIC, in physic, an epithet bestowed on such medicines as are of present efficacy, and potent in operation; and is commonly applied to emetics and cathartics.

DRAVE, a large navigable river, which, taking its rise in the archiepiscopal of Saltzburg, in Germany, runs south-east through Stiria; and continuing its course, divides Hungary from Slavonia, and fall into the Danube at Esseck.

DRAUGHT, in medicine. See POTION.

DRAUGHT, in trade, called also *cloff* or *douch*. is a small allowance on weighable goods, made by the king to the importer, or by the seller to the buyer, that the weight may hold out when the goods are weighed again.

The king allows 1 lb draught for goods weighing no less than 1 Cwt. 2 lb for goods weighing between 1 and 2 Cwt. 3 lb for goods weighing between 2 and 3 Cwt. 4 lb from 3 to 10 Cwt. 7 lb from 10 to 18 Cwt. 9 lb from 18 to 30 or upwards.

DRAUGHT is also used sometimes for a bill of exchange, and commonly for an order for the payment of any sum of money due, &c. Then the person who gives the order is said to draw upon the other.

DRAUGHT, or, as it is pronounced, **DRAFT**, in architecture, the figure of an intended building described on paper; wherein are laid down, by scale and compass, the several divisions and partitions of the apartments, rooms, doors, passages, conveniences, &c. in their due proportion.

It is usual, and exceedingly convenient, before a building is begun to be raised, to have draughts of the ichnography, or ground-plan of each floor or story; as also of the form and fashion of each front, with the windows, doors, ornaments, &c. in an orthography, or upright. Sometimes the several fronts, &c. are taken, and represented in the same draught, to show the effect of the whole building: this is called a *scenography*, or *perspective*.

DRAUGHT, the depth of a body of water necessary to float a ship: hence a ship is said to draw so many feet of water, when she is borne up by a column of water of that particular depth. Thus, if it requires a body of water whose depth is equal to 12 feet, to float or buoy up a ship on its surface, she is said to draw 12 feet water; and that this draught may be more readily known, the feet are marked on the stem and stern post, regularly from the keel upwards.

DRAUGHT-HOOKS, are large hooks of iron, fixed on the cheeks of a cannon-carriage, two on each side, one near the trunnion hole, and the other at the train, distinguished by the name of *fore* and *hind draught-hooks*. Large guns have draught-hooks near the middle trunnion, to which are fixed the chains that serve to keep the shafts of the limbers on a march. The fore and hind hooks are used for drawing a gun backwards or forwards, by men with strong ropes, called *draught-ropes*, fixed to these hooks.

DRAUGHT-HORSE, in farming, a sort of coarse-made horse, defined for the service of a cart or plough.

DRAWBACK, in commerce, certain duties, either of the customs or of the excise, allowed upon the exportation of some of our own manufactures; or upon

certain foreign merchandise, that have paid duty on Drawback importation.

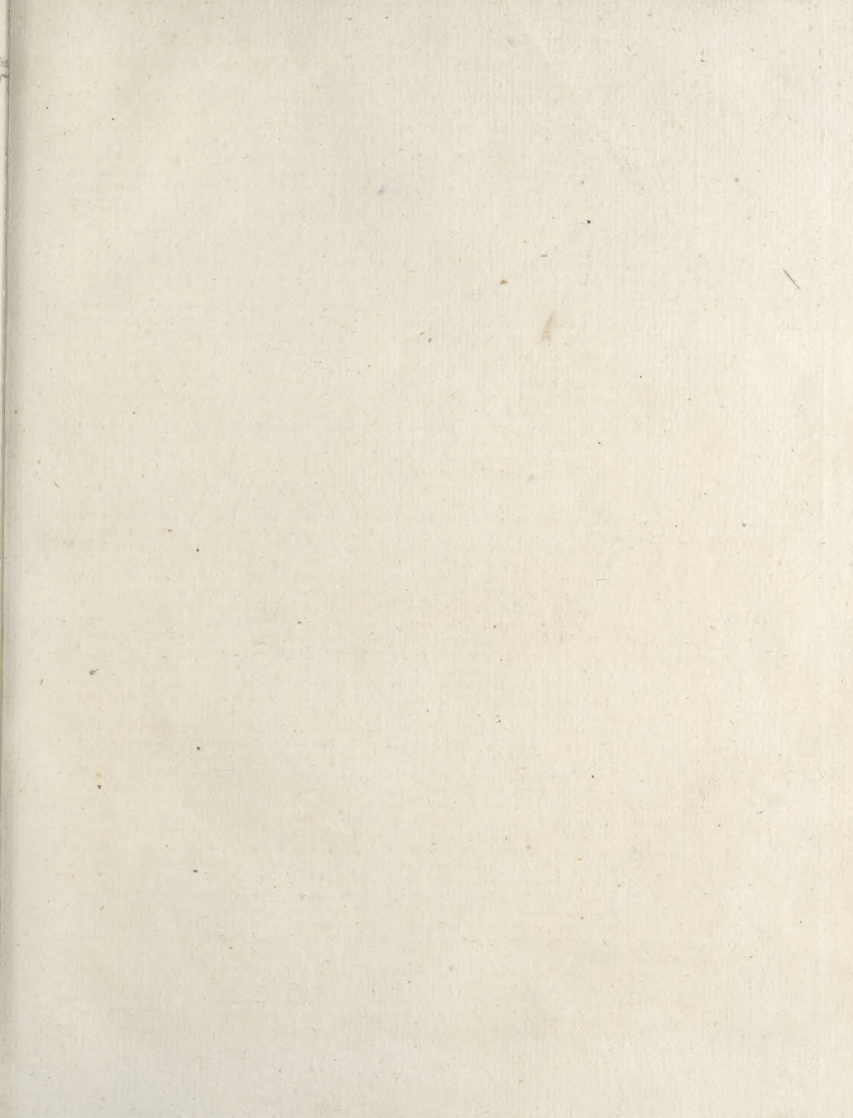
The oaths of the merchants importing and exporting are required to obtain the drawback on foreign goods, affirming the truth of the officers certificate on the entry, and the due payment of the duties: and these may be made by the agent or husband of any corporation or company; or by the known servant of any merchant usually employed in making his entries, and paying his customs. In regard to foreign goods entered outward, if less quantity or value be fraudulently shipped out than what is expressed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no drawback to be allowed for the same. Foreign goods exported by certificate in order to obtain the drawback, not shipped or exported, or re-landed in Great Britain, unless in case of distress to save them from perishing, are to lose the benefit of the drawback, and are forfeited, or their value, with the vessel, horses, carriages, &c. employed in the relanding thereof; and the persons employed in the relanding them, or by whose privity they are re-landed, or into whose hands they shall knowingly come, are to forfeit double the amount of the drawback. Officers of the customs conniving at or assisting in any fraud relating to certificate goods, besides other penalties, are to forfeit their office, and suffer six months imprisonment without bail or mainprize; as are also masters, or persons belonging to the ships employed therein. Bonds given for the exportation of certificate-goods to Ireland must not be delivered up, nor drawback allowed for any goods, till a certificate under the hands and seals of the collector or comptroller, &c. of the customs be produced, testifying the landing.

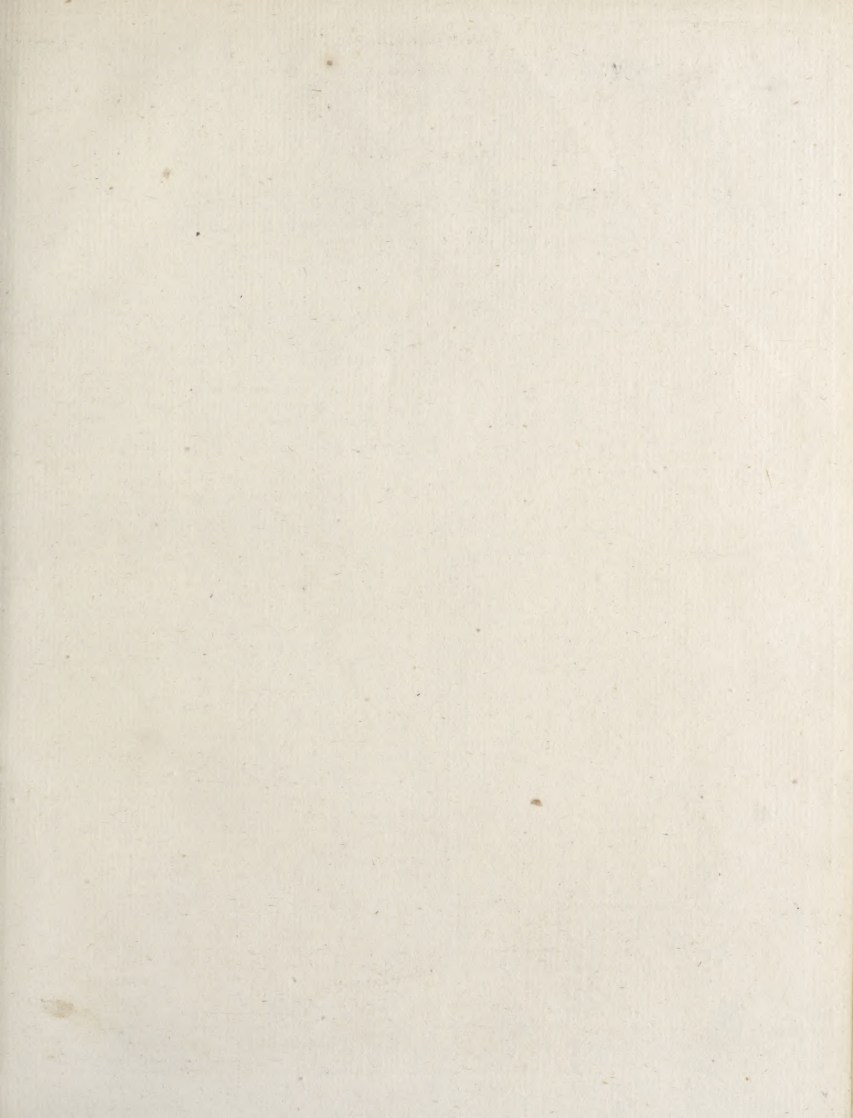
DRAW-BRIDGE, a bridge made after the manner of a float, to draw up or let down, as occasions serve, before the gate of a town or castle. See BRIDGE.

A draw-bridge may be made after several different ways; but the most common are made with plyers, twice the length of the gate, and a foot in diameter. The inner square is traversed with a cross, which serves for a counterpoise; and the chains which hang from the extremities of the plyers to lift up or let down the bridge, are of iron or brass.

In navigable rivers it is sometimes necessary to make the middle arch of bridges with two moveable platforms, to be raised occasionally, in order to let the masts and rigging of ships pass through. This kind of draw-bridge is represented in Plate CLXV. where A B is the width of the middle arch; A L and B L, the two piers that support the draw-bridge N O, one of the platforms of which is raised, and the other let down, having the beam P Q for its piler. To N O are suspended two moveable braces E H, E H; which rest on the support E, press against the bracket M, and thereby strengthen the draw-bridge. These braces are conducted to the rest by means of the weight S, pulling the chain S L F.

DRAW-NET, a kind of net for taking the larger sort of wildfowl, which ought to be made of the best sort of pack-thread, with wide meshes; they should be about two fathoms deep and six long, verged on each side with a very strong cord, and stretched at each end on long poles. It should be spread smooth and flat upon the ground; and strewed over with grass, fedge,







Drawing-net or the like, to hide it from the fowl; and the sportsman is to place himself in some shelter of grass, fern, or some such thing.

DRAWING, in general, denotes the action of pulling out, or hauling along; thus we read of tooth-drawing, wire-drawing, &c.

Drawing

D R A W I N G,

THE art of representing the appearances of objects upon a plain surface, by means of lines, shades, and shadows, formed with certain materials adapted to the purpose.

§ 1. *Of the proper Materials for Drawing, and the Manner of using them.*

THE first thing necessary for a beginner is to furnish himself with proper materials, such as black-lead pencils, crayons of black, white, or red chalk, crow-quill pens, a rule and compasses, camels-hair pencils, and Indian ink. He must accustom himself to hold the pencil farther from the point than one does a pen in writing; which will give him a better command of it, and contribute to render the strokes more free and bold. The use of the pencil is to draw the first sketches or outlines of the piece, as any stroke or line that is amiss may in this be more easily rubbed out than in any other thing; and when he has made the sketch as correct as he can with the pencil, he may then draw carefully the best outline he has got, with his crow-quill pen and ink (A); after which he may discharge the pencil-lines, by rubbing the piece gently with the crumb of stale bread or India rubber. Having thus got the outline clear, his next work is to shade the piece properly, either by drawing fine strokes with his pen where it requires to be shaded, or by washing it with his pencil and the Indian ink. As to his rule and compasses, they are never or very rarely to be used, except in measuring the proportions of figures after he has drawn them, to prove whether they are right or not; or in houses, fortifications, and other pieces of architecture.

§ 2. *Of drawing Lines, Squares, Circles, and other regular and irregular Figures.*

HAVING got all these implements in readiness, the first practice must be to draw straight and curve lines, with ease and freedom, upwards and downwards, sideways to the right or left, or in any direction whatsoever. He must also learn to draw, by command of hand, squares, circles, ovals, and other geometrical figures: for as the alphabet, or a knowledge of the letters, is an introduction to grammar; so is geometry to drawing. The practice of drawing these simple figures till he is master of them, will enable him to imitate, with greater ease and accuracy, many things both in nature and art. And here it is proper to admonish him, never to be in a hurry; but to make himself perfectly master of one figure before he proceeds to another: the advantage, and even necessity, of this, will appear as he proceeds. Two observations more may be added: 1. That he accustom

himself to draw all his figures very large, which is the only way of acquiring a free bold manner of designing. 2. That he practise drawing till he has gained a tolerable master of his pencil, before he attempts to shadow any figure or object of any kind whatever.

§ 3. *Of Drawing Eyes, Ears, Legs, Arms, Hands, Feet, &c.*

AS to the drawing of eyes and ears, legs and arms, the learner will have very little more to do than to copy carefully the examples given in Plate CLXVI. and CLXVII. taken from Sebastian le Clerc's drawing book. But the actions and postures of the hands are so many and various, that no certain rules can be given for drawing them, that will universally hold good. Yet as the hands and feet are difficult members to draw, it is very necessary, and well worth while, to bestow some time and pains about them, carefully imitating their various postures and actions, so as not only to avoid all lameness and imperfection, but also to give them life and spirit. To arrive at this, great care, study, and practice, are requisite; particularly in imitating the best prints or drawings that can be got of hands and feet (some good examples of which are given in Plate CLXVII.); for, as to the mechanical rules of drawing them by lines and measures, they are not only perplexed and difficult, but also contrary to the practice of the best masters. One general rule, however, may be given (which is universally to be observed in all subjects), and that is, Not to finish perfectly at first any single part, but to sketch out faintly, and with light strokes of the pencil, the shape and proportion of the whole hand, with the action and turn of it; and after considering carefully whether this first sketch be perfect, and altering it wherever it is amiss, you may then proceed to the bending of the joints, the knuckles, the veins, and other small particulars, which when the learner has got the whole shape and proportion of the hand or foot, will not only be more easily, but also more perfectly designed.

§ 4. *Of Drawing Faces.*

THE head is usually divided into four equal parts. (1.) From the crown of the head to the top of the forehead. (2.) From the top of the forehead to the eye-brows. (3.) From the eye-brows to the bottom of the nose. (4.) From thence to the bottom of the chin. But this proportion is not constant; those features in different men being often very different as to length and shape. In a well-proportioned face, however, they are nearly right. To direct the learner therefore in forming a perfect face, his first business is to draw an oval, or rather the form of an egg; in the middle

(A) The ink made use of for this purpose must not be common, but Indian ink; which is much softer than the other, and does not run: by mixing it with water, it may be made to any degree of strength, and used in a pen like common ink.

middle of which, from the top to the bottom, draw a perpendicular line. Through the centre or middle of this line draw a diameter line, directly across from one side to the other of your oval. On these two lines all the features of your face are to be placed as follows: Divide your perpendicular line into four equal parts; the first must be allotted to the hair of the head; the second is from the top of the forehead to the top of the nose between the eye-brows; the third is from thence to the bottom of the nose; and the fourth includes the lips and chin. Your diameter line, or the breadth of the face, is always supposed to be the length of five eyes; you must therefore divide it into five equal parts, and place the eyes upon it so as to leave exactly the length of one eye betwixt them. This is to be understood only of a full front face, Plate CLXVI. fig. *a*; for if it turn to either side, then the distances are to be lessened on that side which turns from you, less or more in proportion to its turning, (fig. *b b b*.) The top of the ear is to rise parallel to the eye-brows, at the end of the diameter line; and the bottom of it must be equal to the bottom of the nose. The nostrils ought not to come out farther than the corner of the eye in any face; and the middle of the mouth must always be placed upon the perpendicular line.

§ 5. Of Drawing Human Figures.

WHEN the learner is tolerably perfect in drawing faces, heads, hands, and feet, he may next attempt to draw the human figure at length. In order to which, let him first sketch the head; then draw a perpendicular line from the bottom of the head seven times its length (for the length of the head is about one-eighth part of the length of the figure).

The best proportioned figures of the ancients are $7\frac{1}{2}$ heads in height. If, therefore, the figure stands upright, as fig. (*a*, Plate CLXVIII.) draw a perpendicular line from the top of the head to the heel, which must be divided into two equal parts. The bottom of the belly is exactly the centre. Divide the lower part into two equal parts again, the middle of which is the middle of the knee. For the upper part of the figure, the method must be varied. Take off with your compasses the length of the face (which is three parts in 4 of the length of the head); from the throat-pit to the pit of the stomach is one face, from thence to the navel is another, and from thence to the lower rim of the belly is a third. The line must be divided into seven equal parts. Against the end of the first division, place the breasts; the second comes down to the navel; the third to the privities; the fourth to the middle of the thigh; the fifth to the lower part of the knee; the sixth to the lower part of the calf; and the seventh to the bottom of the heel, the heel of the bearing leg being always exactly under the pit of the throat. But as the essence of all drawing consists in making at first a good sketch, the learner must in this particular be very careful and accurate; he ought to draw no one part perfect or exact till he see whether the whole draught be good; and when he has altered that by his mind, he may then finish one part after another as curiously as he can.

There are some who, having a statue to copy, begin with the head, which they finish, and then proceed in the same manner to the other parts of the body, finish-

ing as they go: but this method generally succeeds ill; for if they make the head in the least too big or too little, the consequence is a disproportion between all the parts, occasioned by their not having sketched the whole proportionably at first. Let the learner remember, therefore, in whatever he intends to draw, first to sketch its several parts, measuring the distances and proportions between each with his finger or pencil, without using the compasses; and then judge of them by the eye, which by degrees will be able to judge of truth and proportion, and will become his best and principal guide. And let him observe, as a general rule, Always to begin with the right side of the piece he is copying: for by that means he will always have what he has done before his eyes; and the rest will follow more naturally, and with greater ease: whereas if he begin with the left side, his hand and arm will cover what he does first, and deprive him of the sight of it; by which means he will not be able to proceed with so much ease, pleasure, or certainty.

As to the order and manner of proceeding in drawing the human body, he must first sketch the head; then the shoulders in the exact breadth; then draw the trunk of the body, beginning with the arm-pits (leaving the arms till afterwards), and so draw down to the hips on both sides; and be sure he observe the exact breadth of the waist. When he has done this, let him then draw that leg which the body stands upon, and afterwards the other which stands loose; then the arms, and last of all the hands.

He must take notice also of the bowings and bendings that are in the body; making the part which is opposite to that which bends correspond to it in bending with it. For instance: If one side of the body bend in, the other must stand out answerable to it; if the back bend in, the belly must stick out; if the knee bend out, the ham must fall in; and so of any other joint in the body. Finally, he must endeavour to form all the parts of the figure with truth, and in just proportion: not one arm or one leg bigger or less than the other; not broad Herculean shoulders, with a thin and slender waist; nor raw and bony arms, with thick and gouty legs: but let there be a kind of harmonious agreement amongst the members, and a beautiful symmetry throughout the whole figure.

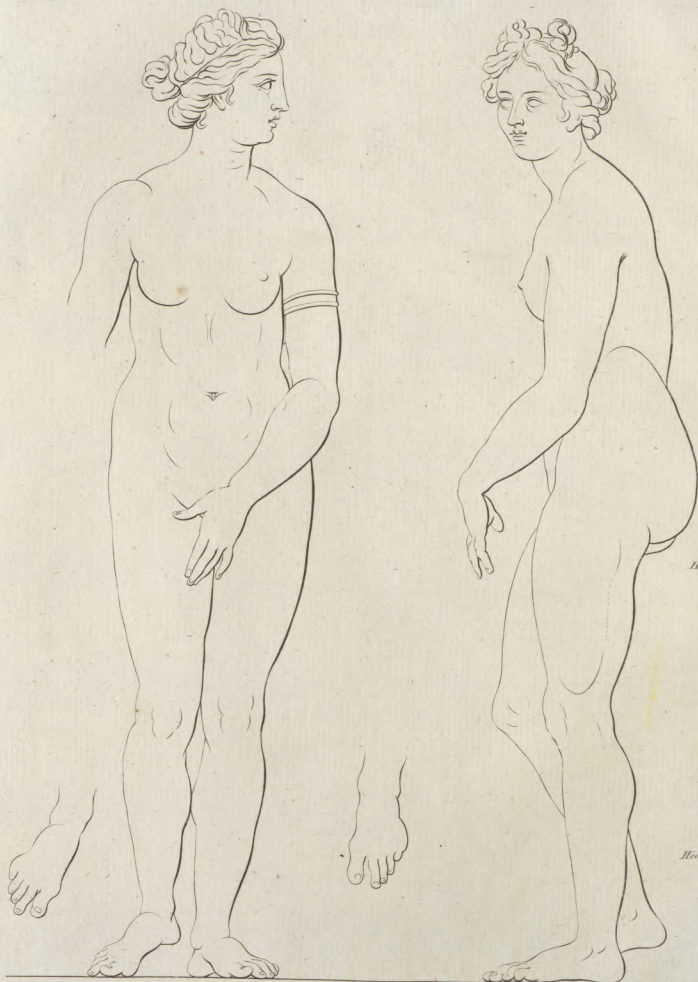
Proportions and Measures of the Human Body. The centre or middle part, between the two extremes of the head and feet of a new born child, is in the navel, but that of an adult is in the os pubis; and the practice of dividing the measures of children into four, five, or six parts, whereof the head is one, is made use of by painters and sculptors.

A child of two years old has about five heads in its whole length, but one of four or five years old has near six; about the fifteenth or sixteenth year, seven heads are the proportion or measure, and the centre inclines to the upper part of the pubis. Hence it appears, as the growth of the body advances, there is a gradual approach to the proportion of an adult of near eight heads in the whole length, of which, as mentioned above, the head makes one.

Agreeable to these principles, the following Table is constructed, exhibiting the proportions of the parts of a man and of a woman, as they were fixed by the ancients, and measured by M. Audran from the Apollo.







pollo Pythius (Plate CLXIX.) in the garden of the Vatican at Rome, and the Venus Aphroditus (Plate CLXX.) belonging to the family of the Medicis. Supposing the figures to stand upright and duly poised on

both legs, the whole height of the former is divided into $31\frac{1}{2}$ parts, being 7 heads 3 parts and 6 minutes; and that of the latter into 31 parts, being 7 heads and 3 parts.

Length of the Head and Trunk of the Body.

From the top of the head to the bottom of the chin 4 parts or
the bottom of the chin to the top of the sternum or breast-bone
the top of the sternum to the pit of the stomach
the pit of the stomach to the navel
the navel to the pubis

Apollo.			Venus.		
Hds.	Pts.	Min.	Hds.	Pts.	Min.
1	0	0	1	0	0
0	1	7	0	1	8
0	3	10	0	3	6
0	2	10	0	2	7
0	3	6	0	3	9
3 3 9			3 3 6		

Length of the head and trunk of the body

Length of the Lower Extremities.

From the pubis to the small of the thigh above the patella or knee-pan
the small of the thigh to the joint or middle of the knee
the joint of the knee to the small of the leg above the ankle
the top to the bottom of the ankle
the bottom of the ankle to the bottom of the heel

1	2	6	1	2	3
0	1	9	0	1	6
1	1	9	1	2	0
0	1	0	0	1	0
0	0	9	0	0	9

Length of the lower extremities

Length of the head and trunk, as above

3	3	9	3	3	6
3	3	9	3	3	6

Total length of the figures

7	3	6	7	3	0
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Length of the Fore-Arm or Upper Extremities.

From the top of the shoulder to the elbow
the elbow to the hand
the joint of the hand to the root of the middle finger
the root to the tip of the middle finger

1	2	3	1	2	3
1	1	2	1	0	6
0	1	8	0	1	6
0	1	10	0	1	7

Length of the upper extremities

3	2	11	3	1	10
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Breadth between the outward angles of the eyes
of the face at the temples
of the upper part of the neck
over the shoulders
of the body below the arm-pits
between the nipples
from the bottom of the chin to the horizontal line of the nipples
of the body at the small of the waist
over the loins or os ilium
over the haunches or tops of the thigh-bones
of the thigh at the top
of the thigh below the middle
of the thigh above the knee
of the leg below the knee
at the calf of the leg
below the calf
above the ankle
of the ankle
below the ankle
middle of the foot
at the roots of the toes
of the arm over the biceps muscle
of the arm above the elbow
of the arm below the elbow over the long supinator
at the wrist
of the hand over the first joint of the thumb
of the hand over the roots of the fingers

0	1	6	0	1	7
0	2	2	0	2	2
0	2	0	0	1	11
2	0	0	1	3	8
1	2	5	1	1	8
1	0	7	0	3	8
1	0	7	1	0	1
1	1	0	1	0	8
1	1	3	1	1	6
1	1	5	1	2	3
0	3	0	0	3	1
0	2	8 $\frac{1}{2}$	0	2	7
0	1	8	0	2	0
0	1	6	0	1	10 $\frac{1}{2}$
0	2	4	0	2	3
0	1	7	0	1	11 $\frac{1}{2}$
0	1	2	0	1	2
0	1	4	0	1	3
0	1	1 $\frac{1}{2}$	0	1	1
0	1	4	0	1	3
0	1	7	0	1	7
0	1	8	0	1	9
0	1	6	0	1	5
0	1	10	0	1	7
0	1	1	0	1	0
0	1	9	0	1	8
0	1	7	0	1	6

	<i>Apollo.</i>			<i>Venus.</i>		
	Hds.	P's.	Min.	Hds.	P's.	Min.
Breadth over the heads of the scapulae or shoulder blades	1	2	0	1	1	4
Length of both arms and hands, each of the Apollos being 3 h. 2 p. 11 m. } and the Venus 3 h. 1 p. 5 m.	7	1	10	6	2	10
Breadth betwixt the tips of the middle fingers of each hand when the arms } are stretched out horizontally	8	3	10	8	0	2

SIDE VIEW.

Length from the top of the head to the shoulder	1	1	8	1	1	6
from the top of the shoulder to the loins above the hip	1	3	3	1	1	7
from the loins to the lower part of the hip	1	0	2	1	2	1
from the hip to the side of the knee, opposite to the top of the patella	1	2	0	1	0	11
from the side of the knee to the bottom of the heel	2	0	5	2	0	11
Length of the figures	7	3	6	7	3	0

SIDE VIEW.

Thickness from the fore to the back part of the skull	0	3	6	0	3	4
from the wing of the nose to the tip of the ear	0	1	8½	0	1	6
of the upper part of the neck	0	2	0	0	1	11
from the breast to the back over the nipples	1	0	6	1	0	6
from the belly to the small of the back	0	3	6	0	3	7
from the belly above the navel to the back of the loins	0	3	9	1	0	2
from the bottom of the belly to the round of the hip	1	0	0	1	0	5
from the fore-part of the thigh to the bottom of the hip	0	3	2	0	3	7
of the thigh at the middle	0	3	3	0	3	6½
of the thigh above the knee	0	2	1	0	2	3
at the middle of the knee below the patella	0	2	1	0	2	2
of the leg below the knee	0	1	9	0	1	11
of the leg at the calf	0	1	8	0	1	9
of the leg at the ankle	0	1	5½	0	1	4
of the foot at the thickest part	0	0	0	0	1	3
length of the foot	1	0	6	1	0	4½
from the fore-part of the bend of the foot to the lower and back part } of the heel	0	0	0	0	2	2
of the arm over the biceps	0	2	0	0	1	9
over the elbow	0	1	6	0	1	6
below the elbow	0	1	5	0	1	7
at the wrist	0	1	1	0	0	11
below the joint of the wrist	0	1	0	0	0	10
of the hand at the roots of the fingers	0	0	5½	0	0	5
at the roots of the nails	0	0	3½	0	0	3

The other most admired antique statues differ a little from these proportions, the Laocoon measuring 7 h. 2 p. 3 m. the Hercules 7 h. 3 p. 7 m. the Pyramus 7 h. 2 p. the Antinous 7 h. 2 p. the Grecian shepherds 7 h. 3 p. 6 m. and the Mirmillo 8 h. But all their other proportions are allowed to be harmonious and agreeable to the characters of the figures they represent.

The most remarkable differences of the symmetry or proportions of a man and of a woman to be observed from the Table are: First, the shoulders of a man are broader, measuring two heads; and the haunches narrower, measuring 1 h. 1 p. 5 m. whereas the shoulders of a woman measure only 1 h. 3 p. 8 m. and the haunches measure 1 h. 2 p. 3 m. The sternum or breast bone of a man is longer, measuring 3 p. 8 m. and the sternum of the woman only 3 p. 3 m. On the contrary, the pelvis of a man is less, measuring from the top to the bottom only 4 p. whereas the pelvis of

a woman measures from the top to the bottom 4 p. 3 m.

It is a leading principle, in which every person conversant in designing has agreed, that without a perfect knowledge of the proportions, nothing can be produced but monstrous and extravagant figures; and it is also universally admitted, that the ancient Greek and Roman sculptors attained the highest success in producing the most perfect models.

The greatest of the modern artists who have examined their figures with attention admit, that several of the ancient sculptors in some degree have excelled nature, they never having found any man so perfect in all his parts as some of their figures are. Their opportunities indeed were great; Greece abounded with beauties; and Rome being mistress of the world, every thing that was curious and beautiful was brought to it from all parts. Their motives were also powerful; religion, glory, and interest. They considered it as a kind

kind of religious worship to give the figures of their gods so much nobleness and beauty as to be able to attract the love and veneration of the people. Their own glory was also concerned, particular honours being bestowed on those who succeeded; and for their fortune they had no further care to take when they once arrived at a certain degree of merit.

Attitudes and Action of the Muscles. If a strong person is to be represented in a vigorous action, such as Hercules, &c. after a suitable proportion to such a figure and the action is designed, the parts or limbs employed in the chiefest force of the action ought to be considered. If the figure is standing, the foot must be placed in a right line, or perpendicular to the trunk or bulk of the body, where the centre of gravity may be placed in *equilibrium*. This centre is determined by the heel; or, if the figure is upon tiptoe, then the ball of the great toe is in the centre. The muscles of the leg which supports the body ought to be swelled, and their tendons drawn more to an extension than those of the other leg, which is only placed so as to receive the weight of the body towards that way to which the action inclines it. For example, suppose Hercules with a club striking at any thing before him towards the left side: Then let his right leg be placed so as to receive the whole weight of the body, and the left loosely touching the ground with its toes. Here the external muscles of the right leg ought to be expressed very strong; but those of the left scarcely appearing more than if it were in some sedentary posture, except in the present case. The foot being extended, the muscles which compose the calf of the leg are in action and appear very strong; though it is not meant that *all* the muscles of the right leg, which supports the weight of the body, ought to be expressed very strong or equally swelled, but those most tumified which are chiefly concerned in the action or posture that the leg is then in. For example, if the leg or tibia is extended, then the extending muscles placed on the thigh are most swelled: if it is bended, then the bending muscles and their tendons appear most. The like may be observed of the whole body in general when it is put into vigorous action. The Laocoon in the Vatican garden at Rome furnishes an example of this muscular appearance through the whole; but in the Antinous, Apollo, and other figures of the ancients, in the Vatican and other places, in postures where no considerable actions are designed, we see their muscles expressed but faintly, or scarcely appearing.

The clavicles or collar bones, and muscles in general, do not appear in women as in men; nor will any action in which a woman uses her utmost strength occasion such swellings or risings of the muscles to appear as they do in men, since the great quantity of fat placed under the skin of women clothes their muscles, &c. as to prevent any such appearances.

Effects of the Exertion of the Muscles. The following are the most obvious effects of the exertion of several of the muscles; of those, to wit, which chiefly demand the attention of an artist.

If either of the miltoid muscles (Plate CLXXXI. 1. 1.) act, the head is turned to the contrary side, and the muscle which performs that action appears very plain under the skin.

If the arms are lifted up, the deltoid muscles placed on the shoulders, which perform that action, swell, and make the extremities of the spines of the shoulder-blades (Plate CLXXII. 3. 3.), called the tops of the shoulders, appear indented or hollow.

The shoulder-blades following the elevation of the arms, their bases (Plate CLXXII. 4. 4.) incline at that time obliquely downward.

If the arms are drawn down, put forwards, or pulled backwards, the shoulder-blades necessarily vary their positions accordingly. All these particulars are to be learned by consulting the life only: when being well acquainted with what then appears in every action, the artist will be able to form an adequate idea how it ought to be expressed. These circumstances are little known; hence seldom attended to in designing.

When the cubit or fore-arm is bended, the biceps (Plate CLXXI. 5. 5.) has its belly very much raised, as appears in the left arm. The like may be observed of the triceps (Plate CLXXII. 6. 6.) when the arm is extended, as observed in the right arm.

The straight muscles of the abdomen (Plate CLXXI. 7. 7.) appear very strong when rising from a decumbent posture.

Those parts of the great serratus muscle (ib. 8. 8.) which are received in the teeth or beginnings of the oblique descending muscle immediately below, are very much swelled when the shoulder on the same side is brought forwards; that serratus muscle then being in action in drawing the scapula forwards.

The long extending muscles of the trunk (Plate CLXXI. 9. 9.) act alternately in walking, after this manner: If the right leg bears the weight of the body, and the left is in translation as on tiptoe, the last mentioned muscles of the back on the left side may be observed to be tumified on the other side about the region of the loins, and so on the other side.

The trochanters, or outward and uppermost heads of the thigh-bones (Plate CLXXII. 10. 10.), vary in their positions in such a manner as no precise observations can explain their several appearances; but the study after the life ought to be carefully attended to.

If the thigh is extended, as when the whole weight of the body rests on that side, the gluteus or buttock muscle (Plate CLXXII. 11. 11.) makes a very different appearance from what offers at another time; but if the thigh is drawn backwards, that muscle appears still more and more tumified.

When the whole leg is drawn upwards forwards, and at the same time the foot is inclined inwards, the upper part of the sartorius muscle (Plate CLXXI. 12. 12.) appears rising very strong; in other positions of the thigh, that muscle makes a furrowing appearance in its whole progress.

If a man is upon tiptoe, the extending muscles of the leg placed on the fore-part of the thigh (Plate CLXXI. 13. 13. 13.), and those of the foot that compose the calf of the leg (Plate CLXXII. 14. 14.), appear very strong, and the long peroneus (Plate CLXXI. 15.) makes a considerable indentation or furrowing at that time in its progress on the outside of the leg.

Many other remarks might here be offered; but a due attention to nature will soon discover them.

§ 6. *Of Light and Shade.*

AFTER the learner has made himself in some measure perfect in drawing outlines, his next endeavour must be to shade them properly. It is this which gives an appearance of substance, shape, distance, and distinction, to whatever bodies he endeavours to represent, whether animate or inanimate. The best rule for doing this is, to consider from what point, and in what direction, the light falls upon the objects which he is delineating, and to let all his lights and shades be placed according to that direction throughout the whole work. That part of the object must be lightest which hath the light most directly opposite to it; if the light falls sideways on the picture, he must make that side which is opposite to it lightest, and that side which is farthest from it darkest. If he is drawing the figure of a man, and the light be placed above the head, then the top of the head must be made lightest, the shoulders next lightest, and the lower parts darker by degrees. That part of the object, whether in naked figures, or drapery, or buildings, that stands farthest out, must be made the lightest, because it comes nearest to the light; and the light loses so much of its brightness, by how much any part of the body bends inward, because those parts that stick out hinder the lustre and full brightness of the light from striking on those parts that fall in. Titian used to say, that he knew no better rule for the distribution of lights and shadows than his observations drawn from a bunch of grapes. Sattins and silks, and all other shining stuffs, have certain glancing reflections, exceeding bright where the light falls strongest. The like is seen in armour, brass pots, or any other glittering metal, where you see a sudden brightness in the middle or centre of the light, which discovers the shining nature of such things. Observe also, that a strong light requires a strong shade, a fainter light a fainter shade; and that an equal balance be preserved throughout the piece between the lights and shades. Those parts which must appear round require but one stroke in shading, and that sometimes but very faint; such parts as should appear steep or hollow, require two strokes across each other, or sometimes three, which is sufficient for the deepest shade. Care must be also taken to make the outlines faint and small in such parts as receive the light; but where the shades fall, the outline must be strong and bold. The learner must begin his shadings from the top, and proceed downward, and use his utmost endeavours both by practice and observation to learn how to vary the shadings properly; for in this consists a great deal of the beauty and elegance of drawing. Another thing to be observed is, that as the human figure is weakened by distances, so objects must seem more or less confused or clear according to the places they hold in the piece: Those that are very distant,—weak, faint, and confused; those that are near and on the foremost ground,—clear, strong, and accurately finished.

§ 7. *Of Drapery.*

IN the art of clothing the figures, or casting the drapery properly and elegantly upon them, many things are to be observed. 1. The eye must never be in doubt of its object; but the shape and proportion of the part or limb, which the drapery is supposed to cover, must

appear; at least so far as art and probability will permit: and this is so material a consideration, that many artists draw first the naked figure, and afterwards put the draperies upon it. 2. The drapery must not fit too close to the parts of the body: but let it seem to flow round, and as it were to embrace them; yet so as that the figure may be easy, and have a free motion. 3. The draperies which cover those parts that are exposed to great light must not be so deeply shaded as to seem to pierce them; nor should those members be crossed by folds that are too strong, lest by the too great darkness of their shades the members look as if they were broken. 4. The great folds must be drawn first, and then stroked into lesser ones: and great care must be taken that they do not cross one another improperly. 5. Folds in general should be large, and as few as possible. However, they must be greater or less according to the quantity and quality of the stuffs of which the drapery is supposed to be made. The quality of the persons is also to be considered in the drapery. If they are magistrates, their draperies ought to be large and ample; if country clowns or slaves, they ought to be coarse and short; if ladies or nymphs, light and soft. 6. Suit the garments to the body, and make them bend with it, according as it stands in or out, straight or crooked; or as it bends one way or another; and the closer the garment fits to the body, the narrower and smaller must be the folds. 7. Folds well imagined give much spirit to any kind of action; because their motion implies a motion in the acting member, which seems to draw them forcibly, and makes them more or less stirring as the action is more or less violent. 8. An artful complication of folds in a circular manner greatly helps the effect of fore-shortenings. 9. All folds consist of two shades, and no more; which you may turn with the garment at pleasure, shadowing the inner side deeper, and the outer more faintly. 10. The shades in silk and fine linen are very thick and small, requiring little folds and a light shadow. 11. Observe the motion of the air or wind, in order to draw the loose apparel all flying one way: and draw that part of the garment that adheres closest to the body before you draw the looser part that flies off from it; lest, by drawing the loose part of the garment first, you should mistake the position of the figure, and place it awry. 12. Rich ornaments, when judiciously and sparingly used, may sometimes contribute to the beauty of draperies. But such ornaments are far below the dignity of angels or heavenly figures; the grandeur of whose draperies ought rather to consist in the boldness and nobleness of the folds, than in the quality of the stuff or the glitter of ornaments. 13. Light and flying draperies are proper only to figures in great motion, or in the wind: but when in a calm place, and free from violent action, their draperies should be large and flowing; that, by their contrast and the fall of the folds, they may appear with grace and dignity. Thus much for drapery; an example or two of which are given in Plate CLXVIII. But see farther the articles CRAYON and PAINTING.

§ 8. *On the Passions.*

THE passions, says M. Le Brun, are motions of the soul, either upon her pursuing what she judges to be for her good, or shunning what she thinks hurtful to her;

her; and commonly, whatever causes emotion of passion in the soul, creates also some action in the body. It is therefore necessary for a painter to know which are the different actions in the body that express the several passions of the soul, and how to delineate them.

M. Le Brun has been extremely happy in expressing many of the passions, and the learner cannot study any thing better than the examples which he has left us of them. However, as M. De Piles justly observes, it is absurd as well as impossible to pretend to give such particular demonstrations of them as to fix their expression to certain strokes, which the painter should be obliged to make use of as essential and invariable rules. This, says he, would be depriving the art of that excellent variety of expression which has no other principle than diversity of imagination, the number of which is infinite. The same passion may be finely expressed several ways, each yielding more or less pleasure in proportion to the painter's understanding and the spectator's discernment.

Though every part of the face contributes towards expressing the sentiments of the heart, yet the eyebrow, according to M. Le Brun, is the principal seat of expression, and where the passions best make themselves known. It is certain, says he, that the pupil of the eye, by its fix and motion, very well shows the agitation of the soul, but then it does not express the kind or nature of such an agitation; whereas the motion of the eye-brow differs according as the passions change their nature. To express a simple passion, the motion is simple; to express a mixed passion, the motion is compound: if the passion be gentle, the motion is gentle; and if it be violent, the motion is so too. We may observe farther, says he, that there are two kinds of elevation in the eye-brows. One, in which the eye-brows rise up in the middle; this elevation expresses agreeable sensations, and it is to be observed that then the mouth rises at the corners: Another, in which the eye-brows rise up at the ends, and fall in the middle; this motion denotes bodily pain, and then the mouth falls at the corners. In laughter, all the parts agree; for the eye-brows, which fall toward the middle of the forehead, make the nose, the mouth, and the eyes, follow the same motion. In weeping, the motions are compound and contrary; for the eye-brows fall toward the nose and over the eyes, and the mouth rises that way. It is to be observed also, that the mouth is the part of the face which more particularly expresses the emotions of the heart: for when the heart complains, the mouth falls at the corners; when it is at ease, the corners of the mouth are elevated; and when it has an aversion, the mouth shoots forward, and rises in the middle.

"The head (says M. De Piles) contributes more to the expression of the passions than all the other parts of the body put together. Those separately can only show some few passions, but the head expresses them all. Some, however, are more peculiarly expressed by it than others: as humility, by hanging it down; arrogance, by lifting it up; languishment, by inclining it on one side; and obtinacy, when with a stiff and resolute air it stands upright, fixed, and stiff between the two shoulders. The head also best shows our supplications, threats, mildness, pride,

"love, hatred, joy, and grief. The whole face, and every feature, contributes something: especially the eyes; which, as Cicero says, are the windows of the soul. The passions they more particularly discover are, pleasure, languishing, scorn, severity, mildness, admiration, and anger; to which one might add joy and grief, if they did not proceed more particularly from the eye-brows and mouth; but when those two passions fall in also with the language of the eyes, the harmony will be wonderful. But though the passions of the soul are most visible in the lines and features of the face, they often require the assistance also of the other parts of the body. Without the hands, for instance, all action is weak and imperfect; their motions, which are almost infinite, create numberless expressions: it is by them that we desire, hope, promise, call, send back; they are the instruments of threatening, prayer, horror, and praise; by them we approve, condemn, refuse, admit, fear, ask; express our joy and grief, our doubts, regrets, pain, and admiration. In a word, it may be said, as they are the language of the dumb, that they contribute not a little to speak a language common to all nations, which is the language of painting. But to say how these parts must be disposed for expressing the various passions, is impossible, nor can any exact rules be given for it, both because the talk would be infinite, and because every one must be guided in this by his own genius and the particular turn of his own studies." See the article PASSIONS, and the Plate there referred to.

§ 9. Of drawing Flowers, Fruits, Birds, Beasts, &c.

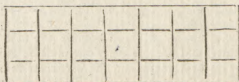
THE learner may proceed now to make some attempts at drawing flowers, fruits, birds, beasts, and the like; not only as it will be a more pleasing employment, but as it is an easier task, than the drawing of hands and feet, and other parts of the human body, which require not only more care, but greater exactness and nicer judgment. Very few rules or instructions are requisite upon this head; the best thing the learner can do is, to furnish himself with good prints or drawings by way of examples, and with great care and exactness to copy them. If it is the figure of a beast, begin with the forehead, and draw the nose, the upper and under jaw, and stop at the throat. Then go to the top of the head, and form the ears, neck, back, and continue the line till you have given the full shape of the buttock. Then form the breast, and mark out the legs and feet, and all the smaller parts. And, last of all, finish it with the proper shadows. It is not amiss, by way of ornament, to give a small sketch of landscape; and let it be suitable and natural to the place or country of the beast you draw. Much the same may be said with regard to birds. Of these, as well as beasts and other objects, the learner will find many examples among the plates given in this work.

§ 10. Of drawing Landscapes, Buildings, &c.

OF all the parts of drawing, this is the most useful and necessary, as it is what every man may have occasion for at one time or another. To be able, on the spot, to take the sketch of a fine building, or a beautiful prospect; of any curious production of art, or

uncommon appearance in nature; is not only a very desirable accomplishment, but a very agreeable amusement. Rocks, mountains, fields, woods, rivers, cataracts, cities, towns, castles, houses, fortifications, ruins, or whatsoever else may present itself to view on our journeys or travels in our own or foreign countries, may be thus brought home, and preserved for our future use either in business or conversation. On this part, therefore, more than ordinary pains should be bestowed.

All drawing consists in nicely measuring the distances of each part of the piece by the eye. In order to facilitate this, let the learner imagine in his own mind, that the piece he copies is divided into squares. For example: Suppose or imagine a perpendicular and a horizontal line crossing each other in the centre of the picture you are drawing from; then suppose also two such lines crossing your own copy. Observe in the original, what parts of the design those lines intersect, and let them fall on the same parts of the supposed lines in the copy: We say, the supposed lines; because though engravers, and others who copy with great exactness, divide both the copy and original into many squares, as below: yet this is a method not to be re-



commended, as it will be apt to deceive the learner, who will fancy himself a tolerable proficient, till he comes to draw after nature, where these helps are not to be had, when he will find himself miserably defective and utterly at a loss.

If he is to draw a landscape from nature, let him take his station on a rising ground, where he will have a large horizon; and mark his tablet into three divisions, downwards from the top to the bottom; and

divide in his own mind the landscape he is to take, into three divisions also. Then let him turn his face directly opposite to the middle of the horizon, keeping his body fixed, and draw what is directly before his eyes upon the middle division of the tablet; then turn his head, but not his body, to the left hand, and delineate what he views there, joining it properly to what he had done before; and, lastly, do the same by what is to be seen upon his right hand, laying down every thing exactly both with respect to distance and proportion. One example is given on plate CLXVIII.

The best artists of late, in drawing their landscapes, make them shoot away one part lower than another. Those who make their landscapes mount up higher and higher, as if they stood at the bottom of a hill to take the prospect, commit a great error: the best way is to get upon a rising ground, make the nearest objects in the piece the highest, and those that are farther off to shoot away lower and lower till they come almost level with the line of the horizon, lessening every thing proportionably to its distance, and observing also to make the objects fainter and less distinct the farther they are removed from the eye. He must make all his lights and shades fall one way, and let every thing have its proper motion: as trees shaken by the wind, the small boughs bending more, and the large ones less: water agitated by the wind, and dashing against ships or boats; or falling from a precipice upon rocks and stones, and spitting up again into the air, and sprinkling all about: clouds also in the air, now gathered with the winds; now violently condensed into hail, rain, and the like: Always remembering, that whatever motions are caused by the wind must be made all to move the same way, because the wind can blow but one way at once.

Finally, it must be observed, that in order to attain any considerable proficiency in drawing, a knowledge of PERSPECTIVE is absolutely necessary; see that article.

D R A

Dray,
Drayton.

DRAY, a kind of cart used by brewers for carrying barrels of beer or ale; also a sledge drawn without wheels.

DRAY, among sportsmen, denotes squirrel nests built in the tops of trees.

DRAYTON (Michael), an eminent English poet, born of an ancient family in Warwickshire in 1563. His propensity to poetry was extremely strong, even from his infancy; and we find the most of his principal poems published, and himself highly distinguished as a poet, by the time he was about 30 years of age.—It appears from his poem of *Moses's Birth and Miracles*, that he was a spectator at Dover of the famous Spanish armada, and it is not improbable that he was engaged in some military employment there. It is certain, that not only for his merit as a writer, but his valuable qualities as a man, he was held in high estimation, and strongly patronized by several personages of consequence; particularly by Sir Henry Goodere, Sir Walter Aston, and the Counts of Bedford; to the first of whom he owes himself indebted for great part of his education, and by the second he was for many years supported.

D R E

His poems are very numerous; and so elegant, that his manner has been copied by many modern writers of eminence since. Among these the most celebrated one is the *Poly-Albion*, a chorographical description of England, with its commodities, antiquities, and curiosities, in metre of 12 syllables; which he dedicated to Prince Henry, by whose encouragement it was written: and whatever may be thought of the poetry, his descriptions are allowed to be exact. He was styled *poet laureat* in his time: which, as Ben Jonson was then in that office, is to be understood in a loose sense of approbation as an excellent poet; and was bestowed on others as well as Drayton, without being confined strictly to the office known by that appellation. He died in 1631; and was buried in Westminster-abbey among the poets, where his bust is to be seen, with an epitaph penned by Ben Jonson.

DREAMS, are all those thoughts which people feel passing through their minds, and those imaginary transactions in which they often fancy themselves engaged, when in the state of sleep.

Scarce any part of nature is less open to our observation than the human mind in this state. The dreamer

Drayton,
Dreams.

dreamer himself cannot well observe the manner in which dreams arise or disappear to him. When he awakes, he cannot recollect the circumstances of his dreams with sufficient accuracy. Were we to watch over him with the most vigilant attention, we could not perceive with certainty what emotions are excited in his mind, or what thoughts pass through it, during his sleep. But though we could ascertain these phenomena, many other difficulties would still remain. What parts of a human being are active, what dormant, when he dreams? Why does not he always dream while asleep? Or why dreams he at all? Do any circumstances in our constitution, situation, and peculiar character, determine the nature of our dreams?

We may lay before our readers such facts as have been ascertained concerning dreaming, and the most plausible conjectures that have been offered to explain those particulars, about which we can only conjecture, or have at least hitherto obtained nothing more certain than conjecture.

1. In dreaming, we are not conscious of being asleep. This is well known from a thousand circumstances. When awake, we often recollect our dreams; and we remember on such occasions, that while those dreams were passing through our minds, it never occurred to us that we were separated by sleep from the active world. We are often observed to act and talk in dreaming as if we were busily engaged in the intercourse of social life.

2. In dreaming, we do not consider ourselves as witnessing or bearing a part in a fictitious scene: we seem not to be in a similar situation with the actors in a dramatic performance, or the spectators before whom they exhibit, but engaged in the business of real life. All the varieties of thought that pass through our minds when awake may also occur in dreams; all the images which imagination presents in the former state, she is also able to call up in the latter; all the same emotions may be excited, and we are often actuated by equal violence of passion; none of the transactions in which we are capable of engaging while awake is impossible in dreams: in short, our range of action and observation is equally wide in the one state as in the other; and while dreaming, we are not sensible of any distinction between our dreams and the events and transactions in which we are actually concerned in our intercourse with the world.

3. It is said, that all men are not liable to dream. Dr Beattie, in a very pleasing essay on this subject, relates, that he knew a gentleman who never dreamed except when his health was in a disordered state: and Locke mentions somewhere, that a certain person of his acquaintance was a stranger to dreaming till the 26th year of his age; and then began to dream in consequence of having a fever. These instances, however, are too few, and we have not been able to obtain more; and, besides, it does not appear that those persons had always attended, with the care of a philosopher making an experiment, to the circumstances of their sleep. They might dream, but not recollect their dreams on awaking; and they might both dream and recollect their dreams immediately upon awaking, yet afterwards suffer the remembrance of them to slip out of the memory. We do not advance this therefore as

a certain fact concerning dreaming; we are rather inclined to think it a mistake.

But though it appears to be by no means certain that any of the human race are through the whole of life absolute strangers to dreaming; yet it is well known that all men are not equally liable to dream. The same person dreams more or less at different times; and as one person may be more exposed than another to those circumstances which promote this exercise of fancy, one person may therefore dream more than another. The same diversity will naturally take place in this as in other accidents to which mankind are in general liable.

4. Though in dreams imagination appears to be free from all restraint, and indulges in the most wanton freaks; yet it is generally agreed, that the imaginary transactions of the dreamer bear always some relation to his particular character in the world, his habits of action, and the circumstances of his life. The lover, we are told, dreams of his mistress; the miser of his money; the philosopher renews his researches in sleep often with the same pain and fatigue as when awake; and even the merchant, at times, returns to balance his books, and compute the profits of an adventure, when slumbering on his pillow. And not only do the more general circumstances of a person's life influence his dreams; his passions and habits are nearly the same when asleep as when awake. A person whose habits of life are virtuous, does not in his dreams plunge into a series of crimes; nor are the vicious reformed when they pass into this imaginary world. The choleric man finds himself offended by slight provocations as well in his dreams as in his ordinary intercourse with the world, and a mild temper continues pacific in sleep.

5. The character of a person's dreams is influenced by his circumstances when awake in a still more unaccountable manner. Certain dreams usually arise in the mind after a person has been in certain situations. Dr Beattie relates, that he once, after riding 30 miles in a high wind, passed a part of the succeeding night in dreams beyond description terrible. The state of a person's health, and the manner in which the vital functions are carried on, have a considerable influence in determining the character of dreams. After too full a meal, or after eating of an unusual sort of food, a person has always dreams of a certain nature.

6. In dreaming, the mind for the most part carries on no intercourse through the senses with surrounding objects. Touch a person gently who is asleep, he feels not the impression. You may awake him by a smart blow; but when the stroke is not sufficiently violent to awake him, he remains insensible of it. We speak softly beside a person asleep without fearing that he overhear us. His eye-lids are shut; and even though light should fall upon the eye-ball, yet still his powers of vision are not awakened to active exertion, unless the light be so strong as to rouse him from sleep. He is insensible both to sweet and to disagreeable smells. It is not easy to try whether his organs of taste retain their activity, without awakening him; yet from analogy it may be presumed that these too are inactive. With respect to the circumstances here enumerated, i.e.

Dreams. it is indifferent whether a person be dreaming or buried in deep sleep.

Yet there is one remarkable fact concerning dreaming which may seem to contradict what has been here asserted. In dreams, we are liable not only to speak aloud in consequence of the suggestions of imagination, but even to get up, and walk about and engage in little enterprises, without awaking. Now, as we are in this instance so active, it seems that we cannot be then insensible of the presence of surrounding objects. The sleep-walker is really sensible in a certain degree of the presence of the objects around him; but he does not attend to them with all their circumstances, nor do they excite in him the same emotions as if he were awake. He feels no terror on the brink of a precipice; and in consequence of being free from fear, he is also without danger in such a situation unless suddenly awakened. This is one of the most inexplicable phenomena of dreaming.

There is also another fact not quite consonant with what has been above advanced. It is said, that in sleep a person will continue to hear the noise of a cataract in the neighbourhood, or regular strokes with a hammer, or any similar sound sufficiently loud, and continued uninterruptedly from before the time of his falling asleep. We know not whether he awakes on the sudden cessation of the noise. This fact is asserted on sufficient evidence: it is curious. Even when awake, if very deeply intent on any piece of study, or closely occupied in business, the sound of a clock striking in the neighbourhood, or the beating of a drum, will escape us unnoticed: and it is therefore the more surprising that we should thus continue sensible to sounds when asleep.

7. Not only do a person's general character, habits of life, and state of health, influence his dreams; but those concerns in which he has been most deeply interested during the preceding day, and the views which have arisen most frequently to his imagination, very often afford the subjects of his dreams. When I look forward with anxious expectation towards any future event, I am likely to dream either of the disappointment or the gratification of my wishes. Have I been engaged through the day, either in business or amusements which I have found exceedingly agreeable, or in a way in which I have been extremely unhappy? either my happiness or my misery is likely to be renewed in my dreams.

8. Though dreams have been regarded among almost all nations through the world, at least in some periods of their history, as prophetic of future events; yet it does not appear that this popular opinion has been established on good grounds. Christianity, indeed, teaches us to believe, that the Supreme Being may, and actually does, operate on our minds, and influence at times the determinations of our will, without making us sensible of the restraint to which we are thus subjected. And, in the same manner, no doubt, the suggestions which arise to us in dreams may be produced. The imaginary transactions in which we are then engaged, may be such as are actually to occupy us in life; the strange and seemingly incoherent appearances which are then presented to the mind's eye, may allude to some events which are to befall ourselves or others. It is, therefore, by no means impossible, or

Dreams. inconsistent with the general analogy of nature, that dreams should have a respect to futurity. We have no reason to regard the dreams which are related in the Holy Scriptures to have been prophetic of future events, as not inspired by heaven, or to laugh at the idea of a prophetic dream as absurd or ridiculous.

Yet it would be too much to allow to dreams all that importance which has been ascribed to them by the priesthood among heathen nations, or by the vulgar among ourselves. We know how easily ignorance imposes on itself, and what arts imposture adopts to impose upon others. We cannot trace any certain connection between our dreams and those events to which the simplicity of the vulgar pretends that they refer. And we cannot, therefore, if disposed to confine our belief to certain or probable truths, join with the vulgar in believing them really referable to futurity.

9. It appears that the brutes are also capable of dreaming. The dog is often observed to start suddenly up in his sleep, in a manner which cannot be accounted for any other way than by supposing that he is roused by some impulse received in a dream. The same thing is observable of others of the inferior animals. That they should dream, is not an idea inconsistent with what we know of their economy and manners in general. We may, therefore, consider it as a pretty certain truth, that many, if not all, of the lower species are liable to dream as well as human beings.

It appears, then, that in dreaming we are not conscious of being asleep: that to a person dreaming, his dreams seem realities: that though it be uncertain whether mankind are all liable to dreams, yet it is well known that they are not all *equally* liable to dream: that the nature of a person's dreams depends in some measure on his habits of action, and on the circumstances of his life: that the state of the health too, and the manner in which the vital functions are carried on, have a powerful influence in determining the character of a person's dreams: that in sleep and in dreaming, the senses are either absolutely inactive, or nearly so: that such concerns as we have been very deeply interested in during the preceding day, are very likely to return upon our minds in dreams in the hours of rest: that dreams may be read as prophetic of future events; and therefore, wherever we have such evidence of their having been prophetic as we would accept on any other occasion, we cannot reasonably reject the fact on account of its absurdity; but that they do not appear to have been actually such, in those instances in which the superstition of nations, ignorant of true religion, has represented them as referring to futurity, nor in those instances in which they are viewed in the same light by the vulgar among ourselves: and, lastly, that dreaming is not a phenomenon peculiar to human nature, but common to mankind with the brutes.

We know of no other facts that have been fully ascertained concerning *dreaming*. But we are by no means sufficiently acquainted with this important phenomenon in the history of mind. We cannot tell by what laws of our constitution we are thus liable to be so frequently engaged in imaginary transactions, nor what are the particular means by which the delusion is accomplished. The delusion is indeed remarkably strong. One will sometimes have a book presented to him in a dream, and fancy that he reads, and actually

Dreams.

enter into the nature of the imaginary composition before him, and even remember, after he awakes, what he knows, that he only fancied himself reading (A). Can this be delusion? If delusion, how or for what purposes is it produced? The mind, it would appear, does not, in sleep, become inactive like the body; or at least is not always inactive while we are asleep. When we do not dream, the mind must either be inactive, or the connection between the mind and the body must be considered as in some manner suspended: and when we dream, the mind, though it probably acts in concert with the body, yet does not act in the same manner as when we are awake. It seems to be clouded or bewildered, in consequence of being deprived for a time of the service of the senses. Imagination becomes more active and more capricious: and all the other powers, especially judgment and memory, become disordered and irregular in their operation.

Various theories have been propounded to explain what appears here most inexplicable. The ingenious Mr Baxter, in his Treatise on the Immateriality of the Human Soul, endeavours to prove that dreams are produced by the agency of some spiritual beings, who either amuse or employ themselves seriously in engaging mankind in all those imaginary transactions with which they are employed in dreaming. This theory, however, is far from being plausible. It leads us entirely beyond the limits of our knowledge. It requires us to believe without evidence. It is unsupported by any analogy. It creates difficulties still more inexplicable than those which it has been proposed to remove. Till it appear that our dreams cannot possibly be produced without the interference of other spiritual agents, possessing such influence over our minds as to deceive us with fancied joys, and involve us in imaginary afflictions, we cannot reasonably refer them to such a cause. Besides, from the facts which have been stated as well known concerning dreams, it appears that their nature depends both on the state of the human body and on that of the mind. But were they owing to the agency of other spiritual beings, how could they be influenced by the state of the body? Those must be a *curious* set of spiritual beings who depend in such a manner on the state of our corporeal frame. Better not to allow them existence at all, than to place them in such a dependance.

Wolffius, and after him M. Forney, have supposed, that dreams never arise in the mind, except in consequence of some of the organs of sensation having been previously excited. Either the ear or the eye, or the organs of touching, tasting, or smelling, communicate information, somehow, in a tacit, secret manner; and thus partly rouse its faculties from the lethargy in which they are buried in sleep, and engage them in a series of confused and imperfect exertions. But what passes in dreams is so very different from all that we do when awake, that it is impossible for the dreamer himself to distinguish, whether his powers of sensation *perform* any part on the occasion. It is not necessary that imagination be always excited by sensation. Fancy, even when we are awake, often wan-

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ders from the present scene. *Absence of mind* is incident to the studious: the poet and the mathematician many times forget where they are. We cannot discover from any thing that a person in dreaming displays to the observation of others, that his organs of sensation take a part in the imaginary transactions in which he is employed. In those instances, indeed, in which persons asleep are said to hear sounds; the sounds which they hear are said also to influence, in some manner, the nature of their dreams. But such instances are singular. Since then it appears that the person who dreams is himself incapable of distinguishing either during his dreams, or by recollection when awake, whether any new impressions are communicated to him in that state by his organs of sensation; that even by watching over him, and comparing our observations of his circumstances and emotions, in his dreams, with what he recollects of them after awaking, we cannot, except in one or two singular instances, ascertain this fact; and that the mind is not incapable of acting while the organs of sensation are at rest, and on many occasions refuses to listen to the information which they convey; we may, without hesitation, conclude, that the theory of Wolffius and Forney has been too hastily and incautiously advanced.

Other physiologists tell us, that the mind, when we dream, is in a state of *delirium*. Sleep, they say, is attended with what is called a *collapse* of the brain; during which either the whole or a part of the nerves of which it consists, are in a state in which they cannot carry on the usual intercourse between the mind and the organs of sensation. When the whole of the brain is in this state, we become entirely unconscious of existence, and the mind sinks into inactivity: when only a part of the brain is *collapsed*, as they term it, we are then neither asleep nor awake, but in a sort of delirium between the two. This theory, like the last mentioned, supposes the mind incapable of acting without the help of sensation: it supposes that we know the nature of a state of which we cannot ascertain the phenomena; it also contradicts a known fact, in representing dreams as confused images of things around us, not fanciful combinations of things not existing together in nature or in human life. We must treat it likewise, therefore, as a baseless fabric.

In the last edition of this work, a theory somewhat different from any of the foregoing was advanced on this subject. It was observed, that the nervous fluid, which is allowed to be secreted from the blood by the brain, appears to be likewise absorbed from the blood by the extremities of the nerves. It was farther advanced, that as this fluid was to be considered as the principle of sensibility; therefore, in all cases in which a sufficient supply of it was not absorbed from the blood by the extremities of the nerves, the parts of the body to which those nerves belonged, must be, in some degree, deprived of sensation. From these positions it was inferred, that as long as impressions of external objects continue to communicate a certain motion from the sentient extremities of the nerves to the brain,—so long we continue awake; and that, when

Dreams.

Q

(A) The writer of this article has been told by a respectable old gentleman of his acquaintance, since dead, that he had frequently dreams of this nature. The fact may therefore be considered as unquestionable.

Dreams.

there is a deficiency of this vital fluid in the extremities of the nerves, or when from any other cause it ceases to communicate to the brain the peculiar motion alluded to, we must naturally fall *asleep*, and become insensible of our existence. It followed of consequence, that, in sleep, the nervous fluid between the extreme parts of the nerves and the brain must either be at rest, or be deficient, or be prevented by some means from passing into the brain: and it was concluded, that whenever irregular motions of this fluid were occasioned by any internal cause, *dreaming* was produced.—In this manner it appeared that we might be deceived with regard to the operation of any of the senses;—so as to fancy that we saw objects not actually before us,—to hear imaginary sounds,—to taste,—to feel, and to smell in imagination. The instances of visions which will sometimes arise, and as it were swim before us when awake, though our eyes be shut, *tinnitus aurium*, which is often a symptom in nervous diseases, and the strange feelings in the case of the amputated limb, were produced in proof of this theory, and applied so as to confirm it.

We are still of opinion, that this theory is more plausible, and goes farther towards explaining the nature of *dreaming*, and the manner in which *dreams* are produced, than any other with which we are acquainted. But it must be confessed, upon a review, that even in it there is too much supposition. The nature of the nervous fluid is but imperfectly known, and even its existence not very fully ascertained. The nature of the connection by which the soul and body are united, seems to be almost beyond our comprehension. And till we can apply experiment and observation in a better manner to this branch of physiology, it must undoubtedly remain unknown. To something mysterious in the nature of that connection, the delusion produced in dreams is in all probability owing.

Amid this uncertainty with respect to the manner in which our powers of mind and body perform their functions in dreaming; it is pleasing to find that we can, however, apply to useful purposes the imperfect knowledge which we have been able to acquire concerning this series of phenomena. Our dreams are affected by the state of our health, by the manner in which we have passed the preceding day, by our general habits of life, by the hopes which we most fondly indulge, and the fears which prevail most over our fortitude when we are awake. From recollecting our dreams, therefore, we may learn to correct many imperfections in our conduct; to refrain from bodily exercises, or from meats and drinks that have unfavourable effects on our constitution; to resist, in due time, evil habits that are stealing upon us; and to guard against hopes and fears which detach us from our proper concerns, and unfit us for the duties of life. Instead of thinking what our dreams may forebode, we may with much better reason reflect by what they have been occasioned, and look back to those circumstances in our past life to which they are owing. The sleep of innocence and health is sound and refreshing; their dreams delightful and pleasing. A disordered body, and a polluted or perturbed mind, are haunted in sleep with frightful, impure, and unpleasing dreams.

Some very beautiful fables have been written both by ancients and moderns in the form of dreams. The *Somnium Scipionis* is one of the finest of Cicero's compositions. He who shall carefully peruse this piece with Macrobius's commentary upon it, will acquire from them considerable knowledge of ancient philosophy. In the periodical publications, which have diffused so much elegant and useful knowledge through Britain, the *Tatlers*, *Spectators*, *Guardians*, &c. we find a number of excellent dreams. Addison excelled in this way of writing. The public are now less partial to this species of composition than they formerly were.

Dr Beattie, in his valuable essay on the subject of dreaming, quotes a very fine one from the *Tatler*, and gives it due praise.

The reader who is disposed to speculate farther on this subject, may consult Beattie's *Essays*, Hartley on *Man*, and the principal writers on physiology.

DRELINCOURT (Charles), minister of the reformed church at Paris, was born at Sedan in 1595, where his father enjoyed a considerable post. He had all the qualifications that compose a respectable clergyman; and though he defended the Protestant cause against the Romish religion, was much esteemed even among the Catholics. He is best known in England by his *Consolations against the Fears of Death*, which work was translated, and is often printed. He married the daughter of a rich merchant at Paris, by whom he had 16 children. His third son, professor of physic at Leyden, was physician to the Prince and Princess of Orange before their accession to the crown of England. Bayle has given him a high character. Mr Drelincourt died in 1660.

DRENCH, among farriers, a physical potion for horses. The ingredients for this purpose are to be beat coarsely, and either mingled with a decoction or with wine. Then let all infuse about a quarter of an hour, and give it to the horse with a horn after he has been tied up two hours to the rack.

DREPANE, the ancient name of Corcyra, from the curvity of its figure, resembling a sickle.

DREPANE, *Drepanum*, (anc. geog.), a town of Bithynia, situated between the Sinus Aftacenus and the Bosphorus Thracicus; called *Helenopolis* by Constantine, in honour of his mother Nicephorus Callistus.

DREPANUM (anc. geog.), the promontory Rhium in Achaia; so called because bent in the manner of a sickle.—Another *Drepanum* on the Arabic Gulf, on the side of Egypt. A third on the north side of Crete, situated between Cydonia and the Sinus Amphinallus. A fourth on the west side of Cyprus. A fifth, a promontory of Cyrenaica, on the Mediterranean.

DREPANUM, -i, or *Drepana*, -orum, a town and port on the west side of Sicily, and to the west of mount Eryx: *Drepanitani* the people. Now *Trepano*, a city and port-town on the westmost point of Sicily. E. Long. 12. 8. Lat. 38. 0.

DRESDEN, the capital city of the electorate of Saxony in Germany. It is seated on the river Elbe, which divides it into two parts. One part is called *Old Dresden*, and the other the *New Town*, in the German language *New Stadt*. They are joined together by a stone bridge, supported by 19 piers, and 630 paces in length.

Drelin-
court
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Dresden,
Dressing.

length. As this bridge was too narrow for the crowds of people that were continually passing and repassing, King Augustus, in 1730, caused two walks for foot-passengers to be built, one on each side, in a very wonderful manner; the one for those that go into the city, and the other for those that return back. These are bordered with iron palisades of curious workmanship. Dresden is surrounded by strong and handsome fortifications; and contains, according to the latest accounts, 110,000 inhabitants.

All the buildings of this city are constructed with square free stone, and are almost all of the same height. They have stone from the neighbourhood of Pima, about ten miles from this city, which is readily brought down the Elbe. In general the houses are high and strong; the streets wide, straight, well paved, clean, and well illuminated in the night; and there are large squares, disposed in such a manner, that Dresden may pass for one of the handsomest cities in the world. The elector's palace is a magnificent structure, and abounds in many valuable curiosities both of nature and art. The collection of pictures is reckoned one of the finest that exists, and is valued at 500,000*l*.

Above 700 men are here constantly employed in the porcelain manufacture, the annual expense of which is estimated at no more than 80,000 crowns; and the manufacture yields to the king 200,000 crowns yearly, besides the magnificent presents which he occasionally makes, and the large quantity reserved for the use of his household.

The other most considerable article of trade is silver, of which the mines near Fridburg produce every 15 days near the value of 20,000 dollars. The metal is brought into the city in ingots, where it is immediately coined and delivered to the proprietors.

The court of Dresden is one of the most remarkable in Europe for splendor and profusion. Six thousand five hundred ducats are yearly allowed for comfits and similar articles, which is near twice as much as the king of Prussia allows for the whole expense of his table. The revenues of the elector are estimated at about 1,576,000*l*; which arise from the taxes on lands, and a capitation of six dollars on all males as soon as they commence an apprenticeship or begin to work. People of a higher rank are taxed according to their class, and are liable to be called to account if they assume not an exterior appearance correspondent to the extent of their fortune. Every foreigner pays capitation after residing six months in the country. The Jews are taxed at 50, their wives at 30, and their children at 20 dollars. There is also an excise on all estates and liquors; and 10 *per cent.* is levied out of the incomes of the people.

Though this city lies in a low situation, yet it hath agreeable prospects. It is supplied with the prodigious quantity of provisions, not only out of the neighbourhood, but from Bohemia, which are brought every market-day, which is once a-week. E. Long. 13. 34. N. Lat. 51. 12.

DRESSING of HEMP and FLAX. See *FLAX-Dressing*.

DRESSING of Meats, the preparing them for food by means of culinary fire.

The design of dressing is to loosen the compages or

texture of the flesh, and dispose it for dissolution and digestion in the stomach. Flesh not being a proper food without dressing, is alleged as an argument that man was not intended by nature for a carnivorous animal.

The usual operations are roasting, boiling, and stewing.—In roasting, it is observed, meat will bear a much greater and longer heat than either in boiling or stewing; and in boiling, greater and longer than in stewing. The reason is, that roasting being performed in the open air, as the parts begin externally to warm, they extend and dilate, and so gradually let out part of the rarefied included air, by which means the internal succussions, on which the dissolution depends, are much weakened and abated. Boiling being performed in water, the pressure is greater, and consequently the succussions to lift up the weight are proportionably strong; by which means the coction is hastened; and even in this way there are great differences; for the greater the weight of water, the sooner is the business done.

In stewing, though the heat be infinitely short of what is employed in the other ways, the operation is much more quick, because performed in a close vessel, and full; by which means the succussions are oftener repeated, and more strongly reverberated. Hence the force of Papin's digellor; and hence an illustration of the operation of digestion.

Boiling, Dr Cheyne observes, draws more of the rank strong juices from meat, and leaves it less nutritive, more diluted, lighter, and easier of digestion; roasting, on the other hand, leaves it fuller of the strong nutritive juices, harder to digest, and needing more dilution. Strong, grown, and adult animal food, therefore, should be boiled; and the younger and tenderer roasted.

DRESSING, in surgery, the treatment of a wound or any disordered part. The apparatus of dressing consists of dossils, tents, plaisters, compresses, bandages, bands, ligatures, and strings. See *SURGERY*.

DREXELIUS (Jeremiah), a Jesuit celebrated for his piety and writings, was born at Aurburg, and became preacher in ordinary to the elector of Bavaria. He wrote several pious and practical pieces, which have been printed together in two volumes folio; and died in 1638.

DREVET (Peter) the Younger, an eminent French engraver, was a member of the royal academy of painting and sculpture; and died at Paris in 1739, at 42 years of age. His portraits are neat and elegant; but laboured to the last degree. He particularly excels in representing lace, silk, fur, velvet, and other ornamental parts of dress.—His father was excellent in the same art; and had instructed, but was surpassed by the son. The younger Drevet did not confine himself to portraits. We have several historical prints by him, which in point of neatness and exquisite workmanship are scarcely to be equalled. His most esteemed and best historical print is very valuable; but the first impressions of it are rarely to be met with: it is, The Presentation of Christ in the Temple; a very large plate, lengthwise, from Louis de Bologna. The following deserve also to be particularized. The Meeting of Abraham's Servant with Rebecca at the

Dressing
Drevet.

Drux
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Drill

Well; a large upright plate, from An. Coypel: and Abraham, with his Son Isaac on the Altar, the same, from the same, dated 1707; the first impressions of which are before the work upon the right thigh of Isaac was altered, the curved lines from the button almost down to the knee being in those impressions arched downwards, but in posterior ones arched upwards. Among his portraits, the two following are justly held in the highest estimation: M. Boffuet Bishop of Meaux; a whole-length figure standing, a middling sized upright plate, from Rigaud: and Samuel Bernard; a whole-length figure sitting in a chair, a large upright plate. The first impressions of the last are, before the words *Conseiller d'Etat* were inserted upon the plate.

DREUX, a town in the Isle of France, remarkable for its antiquities; and for the battle which was fought in December 1562 between the Papists and the Protestants, wherein the former gained the victory. Some think it took its name from the priests of Gaul, called the *Druids*, in the times of Paganism. It consists of two parishes, St Stephen's and Notre Dame, called the *great church*, which is pretty well built. It is seated on the river Blaise, at the foot of a mountain, on which is a ruined castle. E. Long. 1. 27. N. Lat. 48. 44.

DRIEPIER, or DNEPIER, a river of Russia, which rises in the forest of Volkonski, near the source of the Volga, about 100 miles from Smolensko. It passes by Smolensko and Mohilef, separates the Ukraine from Poland, flows by Kiof, and falls into the Black Sea between Otzakof and Kinbun. By the acquisition of the province of Mohilef, its whole course is now included within the Russian territories. It begins to be navigable at a little distance above Smolensko, though in some seasons of the year it is so shallow near the town, that the goods must be transported upon rafts and small flat-bottomed boats.

DRIFT, in navigation, the angle which the line of a ship's motion makes with the nearest meridian, when the drives with her side to the wind and waves, and is not governed by the power of the helm: it also implies the distance which the ship drives on that line.

A ship's way is only called *drift* in a storm; and then when it blows so vehemently as to prevent her from carrying any sail, or at least restrains her to such a portion of sail as may be necessary to keep her sufficiently inclined to one side, that the may not be distressed by her violent labouring produced by the turbulence of the sea.

DRIFT, in mining, a passage cut out under the earth betwixt shaft and shaft, or turn and turn; or a passage or way-wrought under the earth to the end of a meer of ground, or part of a meer.

Drift-Sail, a sail used under water, veered out right a-head by theets, as other sails are. It serves to keep the ship's head right upon the sea in a storm, and to hinder her driving too fast in a current.

DRILL, in mechanics, a small instrument for making such holes as punches will not conveniently serve for. Drills are of various sizes, and are chiefly used by smiths and turners.

DRILL, or *Drill-Box*, a name given to an instrument for sowing land in the new method of horse-hoeing husbandry. See AGRICULTURE.

Drill-Sowing, a method of sowing grain or seed

of any kind, so that it may all be at a proper depth in the earth, which is necessary to its producing healthful and vigorous plants. For this purpose a variety of drill-ploughs have been invented and recommended; but from the expence attending the purchase, and the extreme complication of their structure, there is not an instrument of that kind, as yet discovered, that is likely to be brought into general use. This method, however, is greatly recommended in the Geographical Essays, where we have the following observations and experiments.—“ Grain sown by the hand, and covered by the harrows, is placed at unequal depths; the seeds consequently sprout at different times, and produce an unequal crop. When barley is sown late, and a drought succeeds, the grain that was buried in the moisture of the earth soon appears, while such as was left near the surface lies baking in the heat of the sun, and does not vegetate till plentiful rains have moistened the soil. Hence an inequality of the crop, an accident to which barley is particularly liable. The same observation, but in a more striking manner, may be made upon the sowing of turnips. It frequently happens that the husbandman is obliged to sow his seed in very dry weather, in hopes that rain will soon follow; and either rolls or covers it with a bush-harrow. We will suppose, that, contrary to his expectations, the dry weather continues. The feed, being near the surface, cannot sprout without rain. The husbandman is mortified at his disappointment, but is soon satisfied and made easy by a perfect acquiescence in what he thinks is the will of Providence. The scourge that he feels must not be placed to the dispensation of Providence, but has its source in the ignorance of the man himself. Had he judiciously buried the seed in the moist part of the soil with the drill plough, or harrowed it well with the common harrow, his seed would have vegetated in due season, and bountifully repaid him for his toil.

“ In the year 1769, a 15 acre clove was prepared for turnips. The land was in fine condition as to lightness, and had been well manured. On the 24th of June, 14 acres were sown with turnip seed broadcast, and harrowed in with a bush-harrow. The remaining acre was sown the same day with the drill-plough, allowing 14 inches between the rows, and the shares being set near two inches deep. At the time of sowing, the land was extremely dry, and the drought continued from the time of sowing to the 5th of July: so that the broadcast did not make its appearance till about the 8th of that month, at which time the drill turnips were in rough leaf, having appeared upon the surface the sixth day after sowing.

“ In the driest seasons, at the depth of two inches or less, we are sure of finding a sufficiency of moisture to make the seed germinate. When that is once accomplished, a small degree of moisture will carry on the work of vegetation, and bring the tender plants forward to the surface. When extreme dry weather obliges the broadcast farmer to sow late, he has no opportunity of sowing a second time if the fly should get into the field. The drill secures him in some degree against this misfortune, by giving him a full command over the seasons.

“ The excellence of the drill-plough is not confined to turnip-feed; it is an useful instrument for sowing all kinds

Drill

Drill
Drink.

kinds of grain. By burying the seeds at an equal depth, it secures an equal crop in all circumstances of the weather. But this is not the only consideration to the cultivator. It saves near one half of his seed, which is an object of importance to the tillage farmer.

"In the spring of the year 1769, an acre of barley was sown in equidistant rows with the drill-plough, in a field which was sown with the same grain and upon the same day broad-cast. — The broad-cast took three bushels per acre; the drill only six pecks. The drills were eight inches asunder, and the seed was lodged about two inches within the soil. The drill acre was finished within the hour, and the most distinguishing eye could not discover a single grain upon the surface.

"In the course of growing, the drill barley seemed greener and bore a broader leaf than the broad-cast. When the ears were formed throughout the field, the ear of the drill barley was plainly distinguished to be near half an inch longer than the broad-cast, and the grains seemed fuller and better fed.

"Drill-sowing, however, though it may be recommended, as a most rational and judicious practice, has many difficulties to overcome, and perhaps will never be brought into general use. A proper instrument is wanting that would come cheap to the farmer, and have the requisites of strength and simplicity to recommend it. The present instruments cannot by any means be put into the hands of common servants. Should we ever be so happy as to see this objection removed, it is probable that all kinds of grain will be cultivated in drills. Corn growing in that manner has a freer enjoyment of air, and the farmer has an opportunity of hand-hoeing and weeding without injury to the growing crop. This is an object of the utmost consequence in the cultivation of beans and winter corn.

"The best instrument for drilling of grain is the invention of the ingenious Mr Craick, and made by Mr Crichton coach-maker in Edinburgh. It works with four coulters, and the price is 12l. With it, one man, a horse, and a boy, can easily sow four acres a-day."

DRILLING is popularly used for exercising soldiers. The word is derived from the French *drille*, which signifies a *raw soldier*.

DRIMYS, in botany: A genus changed by Murray, in the 14th edit. of *Syst. Veget.* to WINTERA; which see.

DRINK, a part of our ordinary food in a liquid form. See Food.

The general use of drink is, to supply fluid; facilitate solution; in consequence of that, to expedite the evacuation of the stomach, and promote the progress of the aliment through the intestines: for, by the contraction of the longitudinal fibres of the stomach, the pylorus is drawn up, and nothing but fluid can pass; which, by its bulk, makes a hurried progress through the intestines, and so determines a greater excretion by stool, as less then can be absorbed by the lacteals. Hence a large quantity of common water has been found purgative; and, *ceteris paribus*, that aliment which is accompanied with the largest proportion of drink, makes the largest evacuation by stool. Here a question has arisen, about where the feculent part of the aliment is first remarkably collected. It is commonly thought to be in the great guts: but undoubtedly it often begins in the lower part of the ileum,

especially when the drink is in small proportion, and when the progress of the aliment is slow; for when the contents of the guts are very fluid, they are quickly pushed on, and reach the great guts before they deposit any feculency. Another effect of drink is, to facilitate the mixture of the lymph, reffluent from every part of the system, with the chyle. In the blood-vessels, where all must be kept fluid in order to proper mixture, drink increases the fluidity, and gives tension, by its bulk, without concomitant acrimony or too much elasticity, and so strength and oscillatory motion: hence drink contributes to sanguification, as sometimes food gives too dense a nutriment to be acted upon by the solids; and hence also we can see how drink promotes the secretions. These are the effects of drink in general; but what has been said must be taken with some limitations; for the more liquid the food, it is sooner evacuated, and less nourishment is extracted. Hence drink is, in some degree, opposed to nourishment; and so, *ceteris paribus*, those who use least drink are most nourished.

All the effects of drink above mentioned are produced by simple water; and it may be said, that other liquors are fit for drink in proportion to the water they contain. Water, when used as drink, is often impregnated with vegetable and farinaceous substances; but, as drinks, these impregnations are of little consequence: they add, indeed, a little nourishment; but this is not to be regarded in a healthy state. Sometimes we impregnate water with the *fructus acido-dulces*; and then, indeed, it acquires other qualities, of considerable use in the animal economy. All drinks, however, may be reduced to two heads: first, pure water, or where the additional substance gives no additional virtue; secondly, the *fermentata*. Of the first we have already spoken; and the latter have not only the qualities of the first, but also qualities peculiar to themselves.

Fermented liquors are more or less poignant to the taste, and better calculated to quench thirst. Thirst may be owing to various causes: first, to defect of fluid in the system, which occasions a scanty secretion in the mouth, fauces, and stomach; the dryness of the mouth and fauces will also in this case be increased, by their continual exposure to the perpetual flux and reflux of the evaporating air. Secondly, thirst depends on a large proportion of solid viscid food: thirdly, on an alkalescent aliment, especially if it has attained any thing of the putrefactive taint: fourthly, on the heat of the system; but this seems to operate in the same manner as the first cause, giving a sense of dryness from its dissipation of the fluids. The fermented liquors are peculiarly adapted for obviating all these causes; stimulating the mouth, fauces, and stomach, to throw out the saliva and gastric liquor by their poignancy: by their acieency they are fitted to destroy alkalescent acrimony, to quench thirst from that cause; by their fluidity they dilute viscid food; though here, indeed, they answer no better than common water. In two ways they promote the evacuation by stool, and progress through the intestines: first, by their fluidity and bulk; secondly, by their acieency, which, uniting with the bile, forms the peculiar stimulus formerly mentioned. Carried into the blood-vessels, in so far as they retain any of the saline nature, they stimulate the

Drink.

excretories, and promote urine and sweet; correcting thus alkalefency, not only by mixture, but dissipation of the degenerated fluids.

Many physicians, in treating of fermented liquors, have only mentioned these qualities, rejecting their nutritious virtue, which certainly ought to be taken in; though by expediting the evacuation by stool they make less of the nutritious parts of the aliment to be taken up, and by stimulating the excretories make these nutritious parts to be for a shorter time in the system. All these and many more effects arise from fermented liquors. Their accefency sometimes promotes the dissipation of accefency, by increasing that of vegetables, acting as a ferment, and so producing flatulency, purging, cholera, &c.: so that, with vegetable aliment, as little drink is necessary, the most innocent is pure water; and it is only with animal food that fermented liquors are necessary. In warmer climates, *fermentate* would seem necessary to obviate alkalefency and heat. But it should be considered, that though fermented liquors contain an acid, yet they also contain alcohol; which, though it adds stimulus to the stomach, yet is extremely hurtful in the warmer climates, and wherever alkalefency prevails in the system. Nature, in these climates, has given men an appetite for water impregnated with acid fruits, *e.g.* sherbet; but the use of this needs caution, as in these countries they are apt to shun animal food, using too much of the vegetable, and often thus causing dangerous refrigerations, choleras, diarrhas, &c.

Of varieties of fermented liquors. We shall only mention here the chief heads on which these varieties depend. First, they are owing to the quality of the subject, as more or less viscid; and to its capacity also of undergoing an active fermentation, although perhaps the more viscid be more nutritious. Hence the difference between ales and wines; by the first meaning fermented liquors from *farinacea*, by the second from the fruits of plants. It depends, secondly, on the acerbity, acidity, nature, and maturation, of the fruit. Thirdly, the variety depends on the conduct of the fermentation. In general, fermentation is progressive, being at first active and rapid, detaching the fixed air or *gas sylvestre*, at the same time acquiring more acid than before. These qualities of flatulency and acidity remain for some time; but as the fermentation goes on, the liquor becomes more perfect, no air is detached, and alcohol is produced; so that fermented liquors differ according to the progress of the fermentation, and have different effects on the system. When fermentation is stopped before it comes to maturity, though naturally it proceeds in this way, yet by addition of new ferment it may again be renewed with a turbid intestine motion.

DRIVERS, among sportsmen, a machine for driving pheasant-powts, consisting of good strong ozier wands, such as the basket-makers use; these are to be set in a handle, and twisted or bound with small oziars in two or three places. With this instrument the sportsman drives whole eyes of young powts into his nets. See the next article.

DRIVING, among sportsmen, a method of taking pheasant-powts. It is thus: The sportsman finds out the haunts of these birds; and having fixed his nets there, he calls upon them together by a pheasant-call,

imitating the voice of the dam; after this he makes a noise with his driver, which will make them run a little way forward in a cluster; and this he is to repeat till he has made sure of them, which an expert sportsman never fails to do, by driving them into his nets.

DRIVING, in metallurgy, is said of silver, when, in the operation of refining, the lead being burnt away, the remaining copper rises upon its surface in red fiery bubbles.

DRIVING, in the sea-language, is said of a ship, when an anchor being let fall will not hold her fast, nor prevent her sailing away with the wind or tide. The best help in this case is to let fall more anchors, or to veer out more cable; for the more cable she has out, the safer she rides. When a ship is a-hull or a-try, they say she drives to leeward.

DROGHEDA, by the English called *Tredah*, a town of Ireland, in the province of Leinster and county of Lowth, and situated on a bay of the same name, in W. Long. 6. 17. N. Lat. 53. 45. It was formerly very remarkable for its situation and strength. In consequence of this it was much distinguished by the old English monarchs. Edward II. granted it a market and fair; and to these were added other great privileges in succeeding ages, particularly the right of coinage. It was bravely defended against the rebels in 1641. After the cessation of arms it was taken by the duke of Ormond and the earl of Inchiquin; but was retaken by Cromwell in 1649. At this time it suffered so much, that for a long time after it remained almost in ruins. The buildings were exceedingly shattered; and the town being taken by storm, not only the garrison, but the inhabitants, men, women, and children, were mostly put to the sword. By degrees, however, it recovered, and is at present a large and populous place. It is a town and county; and as such sends two representatives to parliament. It has a great share of inland trade, and an advantageous commerce with England: and though the port is but indifferent, and narrow at its entrance, with a bar over which ships of burden cannot pass but at high water, yet a great deal of business is done; so that, from a low and declining port, it is now become rich and thriving.

Drogheda is perhaps one of the strongest instances that can be mentioned of the inestimable benefit of a river in any degree navigable: for though the Boyne is not capable of carrying vessels bigger than barges, or pretty large boats, yet the convenience that this affords of conveying coals by water-carriage through a great extent of country, introduced a correspondence between this place and Whitehaven in Cumberland, to which the revival of its commerce has been in a great measure owing.

DROITWITCH, a town of Worcestershire in England, noted for excellent white salt made from the salt springs in its neighbourhood. It sends two members to parliament. W. Long. 2. 16. N. Lat. 52. 20.

DROMEDARY. See **CAMELUS**.

DROMORE, a town of Ireland, in the county of Down. It is a very ancient town, and the seat of a bishopric. The see was founded by St Colman in the 6th century. It was refounded by King James I. who, by his charters (now preserved in the Rolls-office), granted it very great and uncommon privileges. among
other

Drone.

other marks of royal favour, he distinguishes the bishops of this see by the style of "A. B. by Divine Providence bishop of Dromore:" whereas all other bishops in Ireland, except those of Meath and Kildare, are styled, "by Divine Permission." This see, although the least in its extent, is so complete and perfect in its endowment and jurisdiction, that it need not envy the greatest and most opulent.

DRONE, a kind of large bees which make their appearance in hives about the month of May, but never work nor prepare any honey; and are at last all killed by the rest. Under the article *Bees*, no 20 *et seq.* we have given an account of the experiments of Messrs Debrau and Schirach concerning these animals: but since that article was printed, a Treatise upon Bees and their Management has appeared by Mr Bonner near Berwick on Tweed, who has made the management of bees his study for a great number of years, and who differs from the opinions of the above mentioned gentlemen for the following reasons, which we shall give in his own words. Having mentioned the opinions of Mr Debrau concerning the little drones mentioned in the article above mentioned, he proceeds thus:

"1. Can it be thought that the prying eyes of multitudes in many generations should have escaped seeing those little drones (they being, according to his account, vastly numerous) thrust their posterior parts into the cells? Yet none ever saw them do it except himself; while many have seen the queen do it, though but a single bee.

"2. It is well known the queen is very long behind the wings, wife nature having made her so, in order that she might thrust her posterior part into the cells, and yet her wings scarcely touch them, nor receive the least injury. If these imaginary little drones had to thrust their posterior parts into the cells in the same manner as the queen, certainly their wings would have been made in the same manner short, and their posterior parts long and taper, which is not the case. Whereas were a bee of any kind (the queen excepted) to thrust its hinder part into a common cell, its wings or coats would come over its head, and be antic like, and injure both them and its body. Besides, I scarcely think they could get into the common cells that way at any rate for want of room.

"3. Mr Debrau grants, that without a queen or eggs bees will not begin to work, as well knowing they cannot propagate their species without her; and yet he says, those bees which wanted little drones began to work, and the queen laid eggs, and all went forward, till they were not impregnated, and then they gave over work, and deserted the hive. Certainly those sagacious creatures would have been as sensible that they wanted drones at the very first, when they were put into the hive, and that they could not do without them, as they are sensible when they want a queen, and that it is needless to begin work without her; and it might be added, that two different kinds of drones in one hive does not appear to be probable, or serve any end.

"But I shall narrate some of my own experiments on that head, which will put it, I hope, beyond dispute: On September 1st, I had a hive breeding fast; I took out all her bees (among which were only four large

drones, which I killed), and I put them in a hive that had nothing in her but empty combs: I waited ten days, when, by looking between the combs, I saw her have new-sealed up maggots in her cells. I then took all her bees out, and shook them into a tub full of water, and recovered them gradually; and when recovering, I pressed every one of them, in order to see if I could find any of those little drones, but could not find one; but all and every one of them had stings: they were in number 3000. After which I searched the hive I took them out of, and cut out all her combs that had eggs in them, and found they had new laid eggs, four days old eggs, and maggots in them. I then recovered the queen and all the bees, and put in the same hive again, which had not an egg in her now, and waited other twenty days, and saw her in fine days working very well; a sure indication she was breeding again. I then turned her up, and cut out one of her brood-combs, and saw in it new laid eggs, four days old eggs, and maggots, and some young almost fit for emerging out of their cells.

"The very same day I made a further experiment: I had a hive which I saw had some brood-combs in her, but she had not had a large drone for four weeks before in her: she had not above 500 bees in her, which favoured me, because few in number. I took the hive into a close place in my house, in order that not a single bee should escape me: I then took all her bees out of her, and immersed them in water; and when recovering, I pressed every one of them, and each bee had a sting, as in the former experiment.

"I think the above experiments may satisfy any judicious person, that there is no such thing in being as little drones, unless in Mr Debrau's brain. And if Mr Debrau, who can find 57 in a small swarm of bees, will send me the odd seven, I will send him one of my best hives for them, and he will scarcely think he is ill paid. I add, I never saw a hive in spring, however few bees in her, but the bred some if she had a queen, though to be sure few in proportion to her bees.

"By this time the reader will be very ready, no doubt, to ask me the use of the drones. I beg to be excused on that head, as I have not the least idea of their use in a hive; they do not fecundate the queen, for she can lay and breed too though the never fee them. Their heat does not appear to me to be necessary for hatching the young, as they are mostly hatched before any are bred in a hive: and when drones are in the hive, the weather is so warm, and so many common bees in it, that they appear to have rather too much heat, by their lying out of the hives often.

"I have many times had good hives with few or no drones in them all the year: and Keys is quite wrong when he says a top swarm will not do without drones in her; for I am positive to the contrary, as in the summer 1785 I took off four swarms of mine own in one day with not a single drone in any of them, and they all thrived well, and bred drones in themselves about four weeks after.

"Although I cannot say what use the drones are of to a hive (unless it be to help away with a great deal of her honey, which they are very good at), yet the best hives have them soonest in the year, they generally appearing in such about the latter end of May,

and

Drone.

Drones,
Drops.

and the bees put a period to their lives about Lammass, at which time I give them all the assistance I can. The way they kill them is thus: They pull and bite them with their teeth, and sting them also. I have seen great havoc made of them in one day, as appeared by their lying dead before the door of the hive. But their most effectual way of killing them is their banishing them from the honey-combs; upon which the drones betake themselves to the under edges of the hives in great numbers, and to the board the hive stands on; and sometimes, though rare, I have even seen them come to the outside of the hive, and cluster there about the bulk of a man's hand. When they are banished thus, they are very dull and lifeless: and I have lifted up a hive from the board, and there they would have been sitting close on it, with scarcely three or four common bees among them; and I have trod to death 40 or more at a time.

"We may now take a view of the disadvantages attending the old, and also Mr Debrau's principles on bees, were they true; and next see how a hive of bees may be preserved from coming to ruin, according to my sentiments on them.

"1. The old principles on bees say, that without a queen or royal cell be in a hive, it will come to ruin.

"2. Mr Debrau's principles say, that without little drones be in a hive it will come to ruin.

"3. I say, if a hive have only new laid eggs in her (which may be easily got the greatest part of the year, in case she have none of her own) and common bees, she will find herself a queen, and so thrive.

"According to the old principles, it is easily seen that in case a hive lose her queen when there is no royal cell in her, and no queen can be got to put to her (neither of which can be expected but in June and July), she is entirely ruined.

"According to the Frenchman's scheme, there must be drones in a hive at all times of the year to fecundate the eggs, otherwise the hive is useless. Supposing his sentiments to be true (which however can by no means be admitted, seeing there is no such thing as little drones), how perplexed would the owner be to know when there were little drones in his hives! When he wanted to make an artificial swarm, he might bring off a queen and common bees with her: but how should he come to know whether there were any, or a sufficient quantity, of little drones among them, as they cannot be distinguished from the commons but by immersion and pressure, which would be intolerably troublesome, and next to killing the bees, and not at all practicable? All that could be done would be to hope the best, that there were little drones in her at any time of the year.

"I say, if a queen die in a hive, and that hive have some new-laid eggs in her, or some put to her, in case she have none of her own, she will nourish up some of these eggs to be a queen to herself: and also by taking out a queen and some commons out of a hive (without a single drone, large or small), and putting them in an empty hive, will make a swarm, and the old hive will breed herself a queen again if she have eggs in her."

DRONE-FLY, a two-winged insect, extremely like the common drone-bee, whence also the name.

DROPS, in meteorology, small spherical bodies which the particles of fluids spontaneously form them-

N^o 104.

selves into when let fall from any height. This spherical figure, the Newtonian philosophers demonstrate to be the effect of corpuscular attraction; for considering that the attractive force of one single particle of a fluid is equally exerted to an equal distance, it must follow that other fluid particles are on every side drawn to it, and will therefore take their places at an equal distance from it, and consequently form a round superficies. See the articles *ATTRACTION*, *FLUID*, and *RAIN*.

DROPS, in medicine, a liquid remedy, the dose of which is estimated by a certain number of drops.

English Drops, *Gutta Anglicana*, a name given to a chemical preparation cleemed of great virtue against vapours and lethargic affections, and purchased at 5000l. by king Charles II. from the inventor Dr Goddard. The medicine appeared to be only a spirit drawn by the retort from raw silk, and afterwards rectified with oil of cinnamon, or any other essential oil; and was in reality no better than the common fat volatile oleosum, or any of the volatile spirits impregnated with an essential oil, except that it was less disagreeable than any of them to the taste.

DROPSY, in medicine, an unnatural collection of water in any part of the body. See (the *Index* subjoined to) *MEDICINE*.

DROPWORT, in botany. See *FILIPENDULA*.

Water Dropwort, in botany. See *OENANTHES*.

DROSERA, *ROS SOLIS*, or *Sun-Dew*, in botany: A genus of the pentagynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calyx is quinquefid, the petals five; the capsule unilocular, and quinquevalved at top; the seeds very numerous. There are three species, which grow naturally in boggy places in many parts of the kingdom. They seem to receive the name of *sun-dew* from a very striking circumstance in their appearance. The leaves, which are circular, are fringed with hairs supporting small drops or globules of a pellucid liquor like dew, which continue even in the hottest part of the day and in the fullest exposure to the sun. The whole plant is acrid, and sufficiently caustic to erode the skin: but some ladies know how to mix the juice with milk, so as to make it an innocent and safe application to remove freckles and sun-burn. The juice that exudes from it unmix'd, will destroy warts and corns. The plant hath the same effect upon milk that the common butterwort hath; and like that too is supposed to occasion the rot in sheep.

DROWNING, signifies the extinction of life by a total immersion in water.

In some respects, there seems to be a great similarity between the death occasioned by immersion in water, and that by strangulation suffocation by fixed air, apoplexies, epilepsies, sudden faintings, violent shocks of electricity, or even violent falls and bruises. Physicians, however, are not agreed with regard to the nature of the injury done to the animal system in any or all of these accidents. It is indeed certain, that in all the cases above mentioned, particularly in drowning, there is very often such a suspension of the vital powers as to us hath the appearance of a total extinction of them; while yet they may be again set in motion, and the person restored to life, after a much longer

Drops
||
Drowning.

Drowning. submerſion than hath been generally thought capable of producing abſolute death. It were to be wiſhed, however, that as it is now univerſally allowed that drowning is only a ſuſpenſion of the action of the vital powers, phyſicians could as univerſally determine the means by which theſe powers are ſuſpended; becauſe on a knowledge of theſe means, the methods to be uſed for recovering drowned perſons muſt certainly depend.

Dr de Haen, who hath written a treatiſe on this ſubject, aſcribes this diverſity of opinion among the phyſicians to their being ready to draw general concluſions from a few experiments. Some, having never found water in the lungs, have thought that it never was there; and others, from its preference, have drawn a contrary concluſion. Some have aſcribed the death which happens in caſes of drowning, to that ſpecies of apoplexy which ariſes from a great fulneſs of the ſtomach. But this opinion our author rejects, becauſe in 13 dogs which he had drowned and afterwards diſſected, no ſigns of ſuch a fulneſs appeared. Another reaſon is drawn from the want of the common marks of apoplexy on the diſſection of the brain, and from the actual preſence of water in the lungs. He is of opinion, that the death of drowned perſons happens in conſequence of water getting into the lungs, and ſtopping the blood in the arteries. He then diſcuſſes the queſtion how far the blowing of air into the lungs is uſeful in recovering drowned people. If their death is to be aſcribed to the water entering the lungs, this practice, he obſerves, muſt be hurtful, as it will increaſe the preſſure on the blood-veſſels, or may even force the water into them; which, on the authority of Lewis's experiments, he alleges is poſſible. But, in ſpite of this reaſoning, he aſſerts, that from experience it has been found uſeful. He allows, that the practice of ſuſpending drowned people by the feet muſt be hurtful, by determining the blood too much to the head; but he obſerves, that remedies in ſome reſpects hurtful may be uſed when the advantages derived from them preponderate; and is of opinion, that the practice above mentioned may be uſeful by agitating the viſcera againſt each other, and thus renewing their motions. Cutting the larynx in order to admit air more freely to the lungs, he reckons to be of little or no uſe; but acknowledges, however, that it may ſometimes prove beneficial on account of the irritation occaſioned by the operation.

Dr Cullen, in his Letter to Lord Cathcart concerning the recovery of perſons drowned and ſeemingly dead, tells us, that "From the diſſection of drowned men, and other animals, it is known, that very often the water does not enter into the cavity of the lungs, nor even into the ſtomach, in any quantity to do hurt to the ſyſtem; and, in general, it is known, that, in ſmoſt caſes, no hurt is done to the organization of the vital parts. It is therefore probable, that the death which enſues, or ſeems to enſue, in drowned perſons, is owing to the ſtoppage of reſpiration, and to the ceaſing, in conſequence, of the circulation of the blood, whereby the body loſes its heat, and, with that, the activity of the vital principle."

In the Phil. Tranſ. Vol. LXVI. Mr Hunter gives the following theory. The loſs of motion in drowning, ſeems to ariſe from the loſs of reſpiration; and the

immediate effect this has upon the other vital motions **Drowning.** appears to be the firſt cauſe of the heart's motion ceaſing. It is moſt probable, therefore, Mr Hunter obſerves, that the reſtoration of breathing is all that is neceſſary to reſtore the heart's motion; for if a ſufficiency of life ſtill remains to produce that effect, we may ſuppoſe every part equally ready to move the very inſtant in which the action of the heart takes place, their actions depending ſo much upon it. What makes it very probable, that the principal effect depends upon throwing air into the lungs, is, that children in the birth, when too much time has been ſpent after the loſs of that life which is peculiar to the fetus, loſe altogether the diſpoſition for the new life. In ſuch caſes there is a total ſuſpenſion of the actions of life; the child remains to all appearance dead; and would die, if air was not thrown into its lungs, and the firſt principle of action by that means reſtored. To put this in a clearer light, Mr Hunter gives the reſult of ſome experiments made on a dog in 1755.—A pair of double bellows were provided, which were ſo conſtructed, that by one action air was thrown into the lungs, and by the other the air was ſucked out which had been thrown in by the former, without mixing them together. The muzzle of theſe bellows was fixed into the trachea of a dog, and by working them he was kept perfectly alive. While this artificial breathing was going on, the ſternum was taken off, ſo that the heart and lungs were expoſed to view. The heart then continued to act as before, only the frequency of its action was greatly increaſed. Mr Hunter then ſtopped the motion of the bellows; and obſerved that the contraction of the heart became gradually weaker and leſs frequent, till it left off moving altogether; but by renewing the operation, the motion of the heart alſo revived, and ſoon became as ſtrong and frequent as before. This proceſs was repeated upon the ſame dog ten times; ſometimes ſtopping for five, eight, or ten minutes. Mr Hunter obſerved, that every time he left off working the bellows, the heart became extremely turgid with blood, and the blood in the left ſide became as dark as that in the right, which was not the caſe when the bellows were working. Theſe ſituations of the animal, he obſerves, ſeem to be exactly ſimilar to drowning.

Dr Edmund Goodwyn, in a treatiſe lately published on this ſubject, has endeavoured to aſcertain the effects of ſubmerſion upon living animals in a more accurate manner than had hitherto been done. His firſt care was to determine the ſymptoms which took place before death; and to obſerve theſe, he procured a large glaſs bell in which the animals were to be immerſed. Having inverted, and filled this with water, he put into it ſeveral cats, dogs, rabbits, and ſmaller animals, conſining them among the water till they were apparently dead. In theſe experiments he obſerved, that immediately after ſubmerſion the pulſe became weak and frequent; there was an apparent anxiety about the breaſt, and ſtruggling to relieve it. In theſe ſtruggles the animal roſe to the top of the water, throwing out a quantity of air from the lungs. After this the anxiety increaſes, the pulſe becomes weaker, and the ſtruggles more violent; he riſes again to the ſurface, throws out more air from the lungs, and in his efforts

Drowning. to inspire, a quantity of water commonly passes into the mouth. The skin about the face and lips then becomes blue, the pulse ceases, the sphincters are relaxed, and the animal falls down without sense or motion. On dissecting the bodies of drowned animals, our author met with the following appearances: 1. The external surface of the brain was darker, but the vessels of it were not more turgid than usual, nor was there any appearance of extravasation. 2. The pulmonary arteries and veins were filled with black blood, and the lungs themselves contained some frothy liquid. 3. Notwithstanding these symptoms, the right auricle and ventricle were still contracting and dilating; the left sinus venosus and auricle moving feebly, but the left ventricle at rest. 4. The right and left auricles of the heart, the right ventricle, and the left sinus venosus, were filled with black blood; but the left ventricle only half filled with the same, and a quantity of the same black blood was also contained in the smaller branches of the arteries proceeding from the left ventricle.

This investigation was followed by a most careful and ingenious inquiry concerning the causes of the symptoms already related. To find out whether or not the entrance of water into the lungs was the cause, or whether water really entered the lungs in these cases or not, he drowned several animals among ink; and by inspecting their bodies, found, that though water really did enter, it was in such small quantity that it could not be supposed capable of producing such violent effects. To ascertain this, however, more exactly than could be done by the ink, he drowned other animals in quicksilver; which, by reason of its not being miscible with the animal fluids, could be more accurately collected. By these it appeared that no more than five drachms of the fluid in which a cat was immersed entered her lungs in the time of drowning; and to determine whether or not this could be the occasion of the animal's death, he made the following experiment: Having confined a cat in an erect posture, he made a small opening in the trachea, by cutting one of the cartilaginous rings; and through this opening he introduced two ounces of water into the lungs. The only consequences were a difficulty of breathing and weak pulse; but these soon abated, and it lived several hours afterwards without any apparent inconvenience. On strangling it he found two ounces and a half of water in the lungs. On repeating the experiment with other fluids, he found the difficulty of breathing and alteration in the pulse somewhat greater: but in these instances also they abated in a few hours; and when the animals were strangled, the lungs were found to contain four ounces of fluid.

From all these experiments Dr Goodwyn draws the following conclusions: 1. "A small quantity of fluid usually passes into the lungs in drowning. 2. This water enters the lungs during the efforts to inspire; and mixing with the pulmonary mucus, occasions the frothy appearance mentioned by authors. 3. The whole of this fluid in the lungs is not sufficient to produce the changes that take place in drowning. And hence it follows, that the water produces all the changes that take place in drowning *indirectly*, by excluding the atmospheric air from the lungs." This naturally leads to an investigation of the uses of respiration, and the effects of the air upon the blood and lungs in that

action, which our author traces with great accuracy and very convincing experiments. He begins with attempting to determine the quantity of air drawn in at each inspiration, with the proportional quantity left after expiration. The experiments by which he endeavoured to ascertain these quantities seem to be more uncertain than the others, as indeed there are not data sufficient for them. From such as he had an opportunity of making, however, the following conclusions were deduced: 1. "The lungs contain 109 cubic inches of air after a complete expiration; and this quantity receives an additional quantity of 14 cubic inches during each inspiration. 2. The dilatation of the lungs after expiration is to their dilatation after inspiration as 109 to 123. 3. The blood circulates through the pulmonary vessels in all the degrees of natural respiration. 4. The circulation through them, after expiration, is sufficiently free to keep up the health of the system."

The last part of our author's inquiry, *viz.* concerning the chemical changes produced in the air by respiration, and the effects of the air upon the blood itself, falls naturally to be considered under the article **RESPIRATION**: so that here we shall only observe in general, that his experiments evidently show that the disease produced by drowning arises entirely from the exclusion of the atmospheric air or its deplogilicated part; for which reason he recommends inflating the lungs with that kind of air in preference to any other.

From these different views of this matter, physicians have differed considerably in their account of the methods to be followed in attempting the recovery of drowned persons. De Haen recommends agitation of all kinds; every kind of stimulus applied to the mouth, nose, and rectum; bleeding; heat, both by warm cloths and warm water; blowing air into the trachea; stimulants, such as blisters, warm ashes, &c. applied to the head, ankles, thighs, pit of the stomach, and other parts.

Doctor Cullen's observations on this subject are as follow.—"With respect to the particular means to be employed for the recovery of drowned persons, it is to be observed, in the first place, That such as were recommended and practised, upon a supposition that the suffocation was occasioned by the quantity of water taken into the body, and therefore to be evacuated again, were very unhappily advised. The hanging up of persons by the heels, or setting them upon the crown of the head, or rolling the body upon a cask, were generally practised, upon a supposition altogether false; or upon the supposition of a case which, if real, is apprehended to be irrecoverable. At the same time, these practices were always attended with the danger of bursting some vessels in the brain or lungs, and of rendering thereby some cases incurable that were not so from the drowning alone. All such practices, therefore, are now very properly disapproved of and forbid.

"In those cases in which the body has not been long in the water, and in which therefore the natural heat is not entirely extinguished, nor the irritability of the moving fibres very greatly impaired, it is possible that a good deal of agitation of the body may be the only means necessary to restore the action of the vital or-

Drowning-gans; but in other cases, where the heat and irritability have ceased to a greater degree, it is to me very doubtful, if much agitation can be safe, and if any degree of it can be useful, till the heat and irritability are in some measure restored. In all cases, any violent concussion cannot be safe, and, I believe, is never necessary. It may be proper here to observe also, that in transporting the body from the place where it is taken out of the water, to the place where it may be necessary for applying the proper means of its recovery, all postures exposing to any improper compression, as that of the body's being carried over a man's shoulder, are to be avoided. The body is to be kept stretched out, with the head and upper parts a little raised; and care is to be taken to avoid the neck's being bent much forward. In this manner, laid upon one side, and upon some straw in a cart, it may be most properly conveyed; and the agitation which a pretty brisk motion of the cart may occasion, will, in most cases, do no harm.

"From the account I have given above of the causes, or of the appearances, of death, in drowned persons, it is evident, that the first step to be taken for their recovery is to restore the heat of the body, which is absolutely necessary to the activity of the moving fibres. For this purpose, the body, as soon as possible, is to be stripped of its wet clothes, to be well dried, and to be wrapped up in dry, and (if possible) warm, coverings: and it is to be wished, in all cases, as soon as the report of a person's being drowned is heard, that blankets should be immediately carried to the water-side; so that, as soon as the body is got out of the water, the change of covering just now mentioned may be instantly made; or, if the body has been naked when drowned, that it may be immediately dried, and defended against the cold of the air. Besides covering the body with blankets, it will be further of advantage, if it can be done without loss of time, to cover the drowned body with a warm shirt or waistcoat immediately taken from a living person.

"When, at the time of a person's being drowned, it happens that the sun shines out very hot, I think there can be no better means of recovering the heat, than by exposing the naked body, in every part, to the heat of the sun; while, at the same time, all other means necessary or useful for the recovery of life are also employed.

"When the heat of the sun cannot be employed, the body should be immediately transported to the nearest house that can be got convenient for the purpose: the fittest will be one that has a tolerably large chamber, in which a fire is ready, or can be made; and if possible, the house should afford another chamber, in which also a fire can be provided.

"When the drowned body is brought into such house, and care is at the same time taken that no more people are admitted than are absolutely necessary to the service of the drowned person, every endeavour must be immediately employed for recovering the heat of the body, and that by different measures, as circumstances shall direct.

"If, in the neighbourhood of the place, there be any brewery, distillery, dyery, or fabric which gives an opportunity of immediately obtaining a quantity of

warm water and a convenient vessel, there is nothing more proper than immersing the body in a warm bath. Even where a sufficient quantity of warm water cannot be had at once, the bath may be still practised, if the accident has happened in or very near a town or village, when a great many fires may be at once employed in heating small quantities of water; for in this way the necessary quantity may be soon obtained. To encourage this practice, it is to be observed, that one part of boiling water is more than sufficient to give the necessary heat to two parts of spring or sea water, as it is not proper to apply the bath at first very warm, nor even of the ordinary heat of the human body, but somewhat under it; and, by the addition of warm water, to bring it gradually to a heat very little above it.

"If the drowned body be of no great bulk, it may be conveniently warmed by a person's lying down in bed with it, and taking it near to their naked body, changing the position of it frequently, and at the same time chaffing and rubbing with warm cloths the parts which are not immediately applied to their warm body.

"If none of these measures can be conveniently practised, the body is to be laid upon a bed before a moderate fire, and frequently turned, to expose the different parts of it; and thus, by the heat of the fire gradually applied, and by rubbing the body well with coarse towels, or other cloths well warmed, pains are to be taken for restoring its heat. This will be promoted by warm cloths applied and frequently renewed under the arms and arm-pits; and by hot bricks, or bottles of warm water, laid to the feet.

"In the practice of rubbing, it has been proposed to moisten the cloths applied with camphorated spirits, or other such stimulating substances: but I think this must prove an impediment to the rubbing; and I would not recommend any practice of this kind, except, perhaps, the application of the vinous spirit of sal ammoniac to the wrists and ankles only.

"For recovering the heat of the body, it has been proposed to cover it all over with warm grains, ashes, sand, or salt; and where these, sufficiently warm, are ready at hand, they may be employed; but it is very seldom they can be obtained, and the application might often interfere with other measures that may be necessary. All therefore that I can propose, with respect to the use of these, is to observe, that bags of warm and dry salt may be amongst the most convenient applications to the feet and hands of drowned persons; and the quantity necessary for this purpose may be got pretty quickly by heating the salt in a frying-pan over a common fire.

"While these measures are taking for recovering the heat, means are at the same time to be employed for restoring the action of the moving fibres. It is well known, that the intestines are the parts of the body which, both from their internal situation and peculiar constitution, retain the longest their irritability; and therefore, that, in drowned persons, stimulants applied may have more effect upon the intestines than upon other parts. The action, therefore, of the intestines is to be supported or renewed as soon as possible; as the restoring and supporting the action of such a con-

Drowning. siderable portion of moving fibres as those of the intestines, must contribute greatly to restore the activity of the whole system.

“For exciting the action of the intestines, the most proper mean is, the application of their ordinary stimulus of dilatation; and this is most effectually applied, by forcing a quantity of the air into them by the fundament. Even the throwing in cold air has been found useful: but it will certainly be better if heated air can be employed; and further, if that air can be impregnated with something which, by its acrimony also, may be powerful in stimulating the intestines.

“From all these considerations, the smoke of burning tobacco has been most commonly applied, and has upon many occasions proved very effectual. This will be most properly thrown in by a particular apparatus, which, for other purposes as well as this, should be in the hands of every surgeon; or at least should, at the public expence, be at hand in every part of the country where drownings are likely to happen. With regard to the use of it, I have to observe, that till the tobacco is kindled in a considerable quantity, a great deal of cold air is blown through the box and tube; and as that, as hinted above, is not so proper, care should be taken to have the tobacco very well kindled, and to blow through it very gently, till the heated smoke only passes through. If, upon certain occasions, the apparatus referred to should not be at hand, the measure however may be executed by a common tobacco pipe, in the following manner: A common glyster-pipe that has a bag mounted upon it, is to be introduced into the fundament, and the mouth of the bag is to be applied round the small end of a tobacco-pipe. In the bowl of this, tobacco is to be kindled; and, either by a playing card made into a tube and applied round the mouth of the bowl, or by applying upon this the bowl of another pipe that is empty, and blowing through it, the smoke may be thus forced into the intestines, and, in a little time, in a considerable quantity.

“If none of these means for throwing in the smoke can be employed, it may be useful to inject warm water to the quantity of three or four English pints. This may be done by a common glyster-bag and pipe, but better by a large syringe; and it may be useful to dissolve in the water some common salt, in the proportion of half an ounce to an English pint; and also, to add to it some wine or brandy.

“While these measures for recovering the heat of the body and the activity of the moving fibres are employed, and especially after they have been employed for some time, pains are to be taken to complete and finish the business, by restoring the action of the lungs and heart.

“On this subject, I am obliged to my learned and ingenious colleague Dr Monro, who has made some experiments for ascertaining the best manner of inflating the lungs of drowned persons. By these experiments he finds it may be more conveniently done by blowing into one of the nostrils, than by blowing into the mouth. For blowing into the nostril, it is necessary to be provided with a wooden pipe, fitted at one extremity for filling the nostril, and at the other for being blown into by a person's mouth, or for receiving the pipe of a pair of bellows, to be employed for the

same purpose. Doctor Monro finds, that a person of ordinary strength can blow into such a pipe, with a sufficient force to inflate the lungs to a considerable degree; and thinks the warm air from the lungs of a living person will be most conveniently employed at first; but when it is not soon effectual in restoring the respiration of the drowned person, and that a longer continuance of the inflation is necessary, it may be proper to employ a pair of bellows, large enough at once to contain the quantity of air necessary to inflate the lungs to a due degree.

“Whether the blowing-in is done by a person's mouth, or by bellows, Dr Monro observes, that the air is ready to pass by the gullet into the stomach; but that this may be prevented, by pressing the lower part of the larynx backwards upon the gullet. To persons of a little knowledge in anatomy, it is to be observed, that the pressure should be only upon the cricoid cartilage, by which the gullet may be straitened, while the passage through the larynx is not interrupted.

“When, by blowing thus into the nostril, it can be perceived, by the raising of the chest or belly, that the lungs are filled with air, the blowing in should cease; and by pressing the breast and belly, the air received into the lungs should be again expelled; then the blowing and expulsion should be again repeated; and thus the practice is to be continued, so as to imitate, as exactly as possible, the alternate motions of natural respiration.

“It is hardly necessary to observe, that when the blowing into the nostril is practised, the other nostril and the mouth should be accurately closed.

“If it should happen that in this practice the air does not seem to pass readily into the lungs, Doctor Monro informs me it is very practicable to introduce directly into the glottis and trachea a crooked tube, such as the catheter used for a male adult. For this he offers the following directions: The surgeon should place himself on the right side of the patient; and, introducing the forefinger of his left hand at the right corner of the patient's mouth, he should push the point of it behind the epiglottis; and using this as a directory, he may enter the catheter, which he holds in his right hand, at the left corner of the patient's mouth, till the end of it is passed beyond the point of his forefinger; and it is then to be let fall, rather than pushed into the glottis; and through this tube, by a proper syringe applied to it, air may be with certainty blown into the lungs. I observe, that some such measure had been proposed by *Monf. le Cat* in France; but I have not learned that it has ever been put in practice, and I am afraid it may be attended with several difficulties, and must be left to the discretion of surgeons, who may be properly provided and instructed for this purpose.

“For throwing air with more certainty into the lungs, it has been proposed to open the windpipe in the same manner as is done in the operation which the surgeons call *bronchotomy*, and by this opening to blow into the lungs; and when the blowing into the nostril does not seem to succeed, and a skilful operator is at hand, I allow that the measure may be tried; but I can hardly suppose, that it will be of any advantage when the blowing in by the nostril has entirely failed.

“It is to be hoped, that by blowing into the lungs one way or other, even a quantity of water which had been

Drowning. been taken into the lungs may be again washed out; and the same seems to be the only effectual means of washing out that frothy matter which is found to fill the lungs of drowned persons, and which proves, if I mistake not, the most common cause of their mortal suffocation. This practice, therefore, is to be immediately entered upon, and very assiduously continued for an hour or two together.

"I have now mentioned the measures chiefly to be pursued and depended upon for the recovery of drowned persons; but must still mention some others that may prove considerable helps to it.

"One of these is, the opening the jugular veins to relieve the congestion, which almost constantly occurs in the veins of the head, and is probably a frequent cause of the death of drowned persons. For relieving this congestion, the drawing some blood from the jugulars, very early, may certainly be of service; and it will be particularly indicated by the livid and purple colour of the face. It may even be repeated, according to the effect it seems to have in taking off that suffusion; but when the drowned person is in some measure recovered, and some motion of the blood is restored, it will be proper to be very cautious in making this evacuation, and at least to take care not to push it so far as to weaken too much the recovering, but still weak, powers of life.

"Another measure for recovering the activity of the vital principle, is the application of certain stimulants to the more sensible parts of the body, such as holding the quick-lime spirit of sal ammoniac to the nose, or putting a little of it upon a rag into the nostrils. It has been usual to pour some liquids into the mouth; but it is dangerous to pour in any quantity of liquid, till it appear that the power of swallowing is in some measure restored.

"When a surgeon is at hand, and is provided with proper apparatus, a crooked pipe may be introduced into the gullet; and by this a gill or two of warm wine may be poured down into the stomach, and probably with advantage. But when no such apparatus is at hand, or surgeon to employ it, and the power of swallowing is still doubtful, the trial of pouring liquids into the mouth should be made by a small quantity of warm water alone; and when, from such trial, the power of swallowing shall appear to be recovered, it may then be allowable to favour the further recovery of the person, by pouring in some wine or brandy.—In short, till some marks of the recovery of swallowing and respiration appear, it will not be safe to apply any stimulants to the mouth; excepting that of a few drops of some acrid substance to the tongue, and which are not of bulk enough to slide back upon the glottis: I can think of no stimulant more conveniently and safely to be applied to the mouth and nostrils, than a moderate quantity of tobacco-smoke blown into them.

"Though I do not imagine that drowned persons are ever hurt by the quantity of water taken into their stomach, yet, as a stimulus applied to the stomach, and particularly as the action of vomiting proves a stimulus to the whole system, I can have no objection to the French practice of throwing in an emetic as soon as any swallowing is restored. For this purpose, I would successively throw in some tea-spoonfuls

of the ipecacuanha wine; and when it does not in-**Drowning.**terfere with other necessary measures, the fauces may be gently irritated by an oiled feather thrust into them.

"With regard to the stimulants, I must conclude with observing, That when a body has lain but for a short time in the water, and that therefore its heat and irritability are but little impaired, the application of stimulants alone has been often found effectual for the recovery; but, on the contrary, when the body has lain long in the water, and the heat of it is very much extinguished, the application of any other stimulants than that of tobacco-smoke to the intestines can be of very little service; and the application of others ought never to interfere with the measures for recovering heat and the motion of respiration.

"With respect to the whole of these practices, I expect, from the principles upon which they are in general recommended, it will be understood, that they are not to be soon discontinued, though their effects do not immediately appear. It is obvious, that, in many cases, it may be long before the heat of the body, and the activity of the vital principle, can be restored, although, in a longer time, it may very possibly be accomplished. In fact, it has often happened, that those means employed for one hour have not succeeded, the same continued for two or more hours, have at length had the wished for effects. It should therefore be a constant rule, in this business, that the proper means should be employed for several hours together; unless it happen, that, while no symptoms of returning life appear, the symptoms of death shall, at the same time, go on constantly increasing.

"In the whole of the above I have kept in view chiefly the case of drowned persons: but it will be obvious, that many of the measures proposed will be equally proper and applicable in other cases of suffocation; as those from strangling, the damps of mines, the fumes of charcoal, &c.; and a little attention to the difference of circumstances will lead to the measures most proper to be employed."

Mr Hunter, in the before-mentioned paper, differs pretty considerably from De Haen and Dr Cullen. He observes, that when assistance is soon called in after immersion, blowing air into the lungs will in some cases effect a recovery; but when any considerable time has been lost, he advises stimulant medicines, such as the vapour of volatile alkali, to be mixed with the air; which may easily be done, by holding spirits of hartshorn in a cup under the receiver of the bellows. And, as applications of this kind to the olfactory nerves tend greatly to rouse the living principle, and put the muscles of respiration into action, it may probably, therefore, be most proper to have air impregnated in that manner thrown in by the nose. To prevent the stomach and intestines from being too much distended by the air so injected, the larynx is directed to be gently pressed against the oesophagus and spine.

While this business is going on, an assistant should prepare bed-cloaths, carefully brought to a proper degree of heat. Heat our author considers as congenial with the living principle; increasing the necessity of action, it increases action; cold, on the other hand, lessens the necessity, and of course the action is diminished: to a due degree of heat, therefore, the living principle,

Drowning, principle; he thinks, owes its vigour. From experiments, he says, it appears to be a law in animal bodies, that the degree of heat should bear a proportion to the quantity of life; as life is weakened, this proportion requires great accuracy, while greater powers of life allow it greater latitudes.

After these and several other observations on the same subject, our author proceeds to more particular directions for the management of drowned people.

If bed-cloaths are put over the person, so as scarce to touch him, steams of volatile alkali, or of warm balsams, may be thrown in, so as to come in contact with many parts of the body. And it might probably be advantageous, Mr Hunter observes, to have steams of the same kind conveyed into the stomach. This, we are told, may be done by a hollow bougie and a syringe; but the operation should be very speedily performed, as the instrument, by continuing long in the mouth, might produce sickness, which our author says he would always wish to avoid.

Some of the warm stimulating substances, such as juice of horse-radish, peppermint water, and spirits of hartshorn, are directed to be thrown into the stomach in a fluid state, as also to be injected by the anus. Motion possibly may be of service; it may at least be tried: but as it hath less effect than any other of the usually prescribed stimuli, it is directed to be the last part of the process.

The same care in the operator, in regulating the proportion of every one of these means, is here directed, as was formerly given for the application of heat. For every one of them, our author observes, may possibly have the same property of destroying entirely the feeble action which they have excited, if administered in too great a quantity: instead, therefore, of increasing and hastening the operations on the first signs of returning life being observed, as is usually done, he desires they may be lessened; and advises their increase to be afterwards proportioned, as nearly as possible, to the quantity of powers as they arise.

When the heart begins to move, the application of air to the lungs should be lessened, that, when the muscles of respiration begin to act, a good deal may be left for them to do.

Mr Hunter absolutely forbids blood-letting in all such cases; for, as it not only weakens the animal principle, but lessens life itself, it must consequently, he observes, lessen both the powers and dispositions to action. For the same reason, he is against introducing any thing into the stomach that might produce sickness or vomiting; and, on the same principle, he says, we should avoid throwing tobacco fumes, or any other such articles, up by the anus, as might tend to an evacuation that way.

The following is a description of instruments recommended for such operations by our author.

First, A pair of bellows, so contrived, with two separate cavities, that, by opening them when applied to the nostrils or mouth of a patient, one cavity will be filled with common air, and the other with air sucked out from the lungs, and by shutting them again, the common air will be thrown into the lungs, and that sucked out of the lungs discharged into the room. The pipe of these should be flexible; in length a foot, or a foot and an half; and, at least, three eighths of an inch

in width. By this the artificial breathing may be continued, while the other operations, the application of the stimuli to the stomach excepted, are going on, which could not be conveniently done if the muzzle of the bellows were introduced into the nose. The end next the nose should be double, and applied to both nostrils. *Secondly*, A syringe, with a hollow bougie, or flexible catheter, of sufficient length to go into the stomach, and convey any stimulating matter into it, without affecting the lungs. *Thirdly*, A pair of small bellows, such as are commonly used in throwing fumes of tobacco up by the anus.

Notwithstanding the differences in theory, however, between the physicians above mentioned, it is certain, that within these few years great numbers of drowned people have been restored to life by a proper use of the remedies we have enumerated, and societies for the recovery of drowned persons have been instituted in different places. The first society of this kind was instituted in Holland, where, from the great abundance of canals and inland seas, the inhabitants are particularly exposed to accidents by water. In a very few years 150 persons were saved from death by this society; and many of these had continued upwards of an hour without any signs of life, after they had been taken out of the water. The society was instituted at Amsterdam in 1767: and, by an advertisement, informed the inhabitants of the United Provinces of the methods proper to be used on such occasions; offering rewards at the same time to those who should, with or without success, use those methods for recovering persons drowned and seemingly dead. The laudable and humane example of the Dutch was followed in the year 1768 by the magistrates of health in Milan and Venice; afterwards by the magistrates of Hamburg in the year 1771, by those of Paris in the year 1772, and by the magistrates of London in 1774.

The following directions are given for the recovery of drowned persons by the society at London.

I. As soon as the patient is taken out of the water, the wet cloaths, if the person is not naked at the time of the accident, should be taken off with all possible expedition on the spot (unless some convenient house be very near), and a great-coat or two, or some blankets if convenient, should be wrapped round the body.

II. The patient is to be thus carefully conveyed in the arms of three or four men, or on a bier, to the nearest public or other house, where a good fire, if in the winter season, and a warm bed, can be made ready for its reception. As the body is conveying to this place, great attention is to be paid to the position of the head; it must be kept supported in a natural and easy posture, and not suffered to hang down.

III. In cold or moist weather, the patient is to be laid on a matras or bed before the fire, but not too near, or in a moderately heated room: in warm and sultry weather, on a bed only. The body is then to be wrapped as expeditiously as possible with a blanket, and thoroughly dried with warm coarse cloths or flannels.

IV. In summer or sultry weather too much air cannot be admitted. For this reason it will be necessary to set open the windows and doors, as cool refreshing air is of the greatest importance in the process of resuscitation.

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V. Not more than six persons are to be present to apply the proper means; a greater number will be useless, and may retard, or totally prevent, the restoration of life, by rendering the air of the apartment unwholesome. It will be necessary, therefore, to request the absence of those who attend merely from motives of curiosity.

VI. It will be proper for one of the assistants, with a pair of bellows of the common size, applying the pipe a little way up one nostril, to blow with some force, in order to introduce air into the lungs; at the same time the other nostril and the mouth are to be closed by another assistant, whilst a third person gently presses the chest with his hands, after the lungs are observed to be inflated. By pursuing this process, the noxious and flagrant vapours will be expelled, and natural breathing imitated. If the pipe of the bellows be too large, the air may be blown in at the mouth, the nostrils at the same time being closed, so that it may not escape that way: but the lungs are more easily filled, and natural breathing better imitated, by blowing up the nostril.

VII. Let the body be gently rubbed with common salt, or with flannels, sprinkled with spirits, as rum or geneva (A). A warming-pan heated (the body being surrounded with flannel) may be lightly moved up and down the back. Fomentations of hot brandy are to be applied to the pit of the stomach, loins, &c. and often renewed. Bottles filled with hot water, heated tiles covered with flannel, or hot bricks, may be efficaciously applied to the soles of the feet, palms of the hands, and other parts of the body. The temples may be rubbed with spirits of hartshorn, and the nostrils now and then tickled with a feather; and snuff, or *eau de luce*, should be occasionally applied.

VIII. Tobacco fumes should be thrown up the fundament; if a fumigator be not at hand, the common pipe may answer the purpose. The operation should be frequently performed, as it is of importance; for the good effects of this process have been experienced in a variety of instances of suspended animation. But should the application of tobacco-smoke in this way not be immediately convenient, or other impediments arise, clysters of this herb, or other acid infusions with salt, &c. may be thrown up with advantage.

IX. When these means have been employed a considerable time without success, and any brew-house or warm bath can be readily obtained, the body should be carefully conveyed to such a place, and remain in the bath, or surrounded with warm grains, for three or four hours.

If a child has been drowned, its body should be wiped perfectly dry, and immediately placed in bed between two healthy persons. The salutary effects of the natural vital warmth, conveyed in this manner, have been proved in a variety of successful cases.

X. While the various methods of treatment are employed, the body is to be well shaken every ten minutes, in order to render the process of animation more certainly successful; and children, in particular, are to be much agitated, by taking hold of their legs and

arms frequently and for a continuance of time. In various instances agitation has forwarded the recovery of boys who have been drowned, and continued for a considerable time apparently dead.

XI. If there be any signs of returning life, such as sighing, gasping, or convulsive motions, a spoonful of any warm liquid may be administered; and if the act of swallowing is returned, then a cordial of warm brandy or wine may be given in small quantities and frequently repeated.

XII. Electricity may be tried by the judicious and skilful, as its application neither prevents nor retards the various modes of recovery already recommended; but, on the other hand, will most probably tend to render the other means employed more certainly and more expeditiously efficacious. This stimulus bids fair to prove an important auxiliary in cases of suspended animation; and therefore deserves the serious regard and attention of the Faculty.

The methods which have been fully described, are to be employed with vigour for three hours or upwards, although no favourable circumstances should arise; for it is a vulgar and dangerous opinion to suppose that persons are irrecoverable, because life does not soon make its appearance; an opinion that has consigned to the grave an immense number of the seemingly dead, who might have been restored to life by resuscitation and perseverance.

Bleeding is never to be employed in such cases, unless by the direction of one of the medical assistants, or some other gentleman of the faculty who has paid attention to the resuscitating art.

DRUG, a general term for goods of the druggist and grocery kinds, especially those used in medicine and dyeing. See MATERIA MEDICA, PHARMACY, and DYEING.

DRUGGET, in commerce, a stuff sometimes all wool, and sometimes half wool half thread, sometimes corded, but usually plain. Those that have the woof of wool, and the warp of thread, are called *threaded druggets*; and those wrought with the shuttle on a loom of four marches, as the ferges of Moui, Beauvois, and other like stuffs corded, are called *corded druggets*. As to the plain, they are wrought on a loom of two marches, with the shuttle, in the same manner as cloth, camlets, and other like stuffs not corded.

DRUIDÆ, or DRUIDUM (anc. geog.), a very ancient town, the principal place of the Druides or Druidæ in Gaul, as they are called (Cæsar, Cicero). Now *Dreux* in the Orleanois. Here they met every year in a consecrated grove, according to Cæsar. The town was also called *Durocastet*. W. Long. 1. 21. Lat. 48.

45.

DRUIDS, DAVIDES, or DRUIDÆ, the priests or ministers of religion among the ancient Celts or Gauls, Britons, and Germans.

Some authors derive the word from the Hebrew דרוש *derushim*, or *drushim*, which they translate *contemplatives*. Picard, *Celtopzd.* lib. ii. p. 58. believes the druids to have been thus called from *Druiis*, or *Dryius*, their leader, the fourth or fifth king of the Gauls,

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Druids.

(A) Dr Fothergill of Bath, in a letter to the Register, advises as a potent and active stimulus the patent mustard moistened with spirits.

Druids.

Gauls, and father of Saron or Naumes. Pliny, Salmaſius, Vigenere, &c. derive the name from *seu, oak*; on account of their inhabiting, or at leaſt frequenting, and teaching in foreſts; or perhaps becauſe, as Pliny ſays, they never ſacrificed but under the oak. But it is hard to imagine how the druids ſhould come to ſpeak Greek. Menage derives the word from the old Britiſh *drus*, "dæmon, magician." Borel, from the Saxon *dry*, "magician;" or rather from the old Britiſh *dru*, or *deru*, "oak," whence he takes *seu* to be derived; which is the moſt probable ſuppoſition. Goſſop. Becanus, lib. i. takes *druid* to be an old Celtic and German word, formed from *trovis* or *truvis*, "a doctor of the truth and the faith;" which etymology Voſſius acquieſces in.

I
General ac-
count of the
druids.

The druids were the firſt and moſt diſtinguiſhed order among the Gauls and Britons; they were choſen out of the beſt families; and the honours of their birth, joined with thoſe of their function, procured them the higheſt veneration among the people. They were verſed in aſtrology, geometry, natural philoſophy, politics, and geography; they were the interpreters of religion, and the judges of all affairs indifferently. Whoever reſuſed obedience to them was declared impious and accuſed. We know but little as to their peculiar doctrines; only that they believed the immortality of the ſoul; and, as is generally alſo ſuppoſed, the metemphychoſis; though a late author makes it appear highly probable they did not believe this laſt, at leaſt not in the ſenſe of the Pythagoreans.

The chief ſettlement of the druids in Britain was in the iſle of Angleſey, the ancient *Mona*, which they might chooſe for this purpoſe, as it is well ſtored with ſpacious groves of their favourite oak. They were divided into ſeveral claſſes or branches, viz. the *vacerri*, *bardi*, *eubages*, *ſemnothii* or *ſemnothei*, and *ſaronide*. The *vacerri* are held to have been the prieſts; the *bardi*, the poets; the *eubages*, the augurs; and the *ſaronide*, the civil judges and inſtructors of youth. As to the *ſemnothi*, who are ſaid to have been immediately devoted to the ſervice of religion, it is probable they were the ſame with the *vacerri*. Strabo, however, (lib. iv. p. 197.) and Picard after him in his Celtopædia, do not comprehend all theſe different orders under the denomination of druids, as ſpecies under their genus, or parts under the whole; but make them quite different conditions or orders. Strabo, in effect, only diſtinguiſhes three kinds; *bardi*, *vates*, and *druids*. The *bardi* were the poets; the *vates*, *vatus* (apparently the ſame with the *vacerri*), were the prieſts and naturaliſts; and the *druids*, beſide the ſtudy of nature, applied themſelves likewiſe to morality.

Diogenes Laërtius affures us, in his Prologue, that the druids were the ſame among the ancient Britons with the ſophi or philoſophers among the Greeks; the magi among the Perſians; the gymnoſophiſts among the Indians; and the Chaldeans among the Aſſyrians.

Their garments were remarkably long; and, when employed in religious ceremonies, they always wore a white ſurplice. They generally carried a wand in their hands; and wore a kind of ornament enchaſed in gold about their necks, called the *druid's egg*. Their necks were likewiſe decorated with gold chains, and their

hands and arms with bracelets: they wore their hair very ſhort, and their beards remarkably long.

The druids had one chief, or arch-druid, in every nation, who acted as high-prieſt, or *pontifex maximus*. He had abſolute authority over the reſt; and commanded, decreed, puniſhed, &c. at pleaſure. At his death he was ſucceeded by the moſt conſiderable among his ſurvivors; and, if there were ſeveral pretenders, the matter was ended by an election, or elie put to the deciſion of arms.

The druids, we have obſerved, were in the higheſt eſteem. They preſided at ſacrifices, and other ceremonies; and had the direction of every thing relating to religion. The Britiſh and Gauliſh youth ſtocked to them in crowds, to be inſtructed by them. The children of the nobility, Mela tells us, they retired with into caves, or the moſt deſolate parts of foreſts, and kept them there ſometimes for twenty years under their diſcipline. Beſide the immortality and metemphychoſis, they were here inſtructed in the motion of the heavens, and the courſe of the ſtars; the magnitude of the heavens and the earth; the nature of things; the power and wiſdom of the gods, &c. They preſerved the memory and actions of great men in their verſes, which they never allowed to be wrote down, but made their pupils get them by heart. In their common courſe of learning, they are ſaid to have taught them twenty-four thouſand ſuch verſes. By this means their doctrines appeared more myſterious by being unknown to all but themſelves; and having no books to recur to, they were the more careful to fix them in their memory.

They worſhipped the Supreme Being under the name of *Eſus*, or *Heſus*, and the ſymbol of the oak; and had no other temple than a wood or a grove, where all their religious rites were performed. Nor was any perſon admitted to enter that ſacred recess, unleſs he carried with him a chain, in token of his abſolute dependence on the Deity. Indeed, their whole religion originally conſiſted in acknowledging, that the Supreme Being, who made his abode in theſe ſacred groves, governed the univerſe; and that every creature ought to obey his laws, and pay him divine homage.

They conſidered the oak as the emblem, or rather the ſpeculiar reſidence, of the Almighty; and accordingly chaplets of it were worn both by the druids and people in their religious ceremonies, the altars were ſtrewn with its leaves and encircled with its branches. The fruit of it, eſpecially the miſſetoe, was thought to contain a divine virtue, and to be the peculiar gift of heaven. It was therefore fought for on the ſixth day of the moon with the greateſt earneſtneſs and anxiety; and when found was hailed with ſuch raptures of joy, as almoſt exceeds imagination to conceive. As ſoon as the druids were informed of this fortunate diſcovery, they prepared every thing ready for the ſacrifice under the oak, to which they ſtaſſened two white bulls by the horns; then the arch-druid, attended by a prodigious number of people, aſcended the tree, dreſſed in white; and with a conſecrated golden knife, or pruning hook, cropped the miſſetoe, which he received in his ſagum or robe, amidſt the rapturous exclamations of the people. Having ſe-

Druids.

curved

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cured this sacred plant, he defended the tree; the bulls were sacrificed; and the Deity invoked to bless his own gift, and render it efficacious in those dilemmers in which it should be administered.

The consecrated groves, in which they performed their religious rites, were fenced round with stones, to prevent any person's entering between the trees, except through the passages left open for that purpose, and which were guarded by some inferior druids, to prevent any stranger from intruding into their mysteries. These groves were of different forms; some quite circular, others oblong, and more or less capacious as the votaries in the districts to which they belonged were more or less numerous. The area in the centre of the grove was encompassed with several rows of large oaks set very close together. Within this large circle were several smaller ones furrounded with large stones; and near the centre of these smaller circles, were stones of a prodigious size and convenient height, on which the victims were slain and offered. Each of these being a kind of altar, was furrounded with another row of stones, the use of which cannot now be known, unless they were intended as inclosures to keep the people at a convenient distance from the officiating priest.

Suetonius, in his life of Claudius, assures us the druids sacrificed men; and Mercury is said to be the god to whom they offered these victims. Diod. Siculus, lib. vi. observes it was only upon extraordinary occasions they made such offerings; as, to consult what measures to take, to learn what should befall them, &c. by the fall of the victim, the tearing of his members, and the manner of his blood gushing out. Augustus condemned the custom, and Tiberius and Claudius punished and abolished it.

We learn from Cæsar, that the druids were the judges and arbiters of all differences and disputes, both public and private: they took cognizance of murders, inheritances, boundaries, and limits; and decreed rewards and punishments. Such as disobeyed their decisions they excommunicated, which was their principal punishment; the criminal being hereby excluded from all public assemblies, and avoided by all the world; so that nobody durst speak to him for fear of being polluted. Strabo observes, they had sometimes interest and authority enough to stop armies upon the point of engaging, and accommodate their differences.

It hath been disputed, whether the druids were themselves the inventors of their opinions and systems of religion and philosophy, or received them from others. Some have imagined, that the colony of Phocians which left Greece and built Marfeilles in Gaul about the 5th Olympiad, imported the first principles of learning and philosophy, and communicated them to the Gauls and other nations in the west of Europe. It appears, indeed, that this famous colony contributed not a little to the improvement of that part of Gaul where it settled, and to the civilization of its inhabitants. "The Greek colony of Marfeilles (says Justin) civilized the Gauls, and taught them to live under laws; to build cities and inclose them with walls; to raise corn; to cultivate the vine and olive; and, in a word, made so great a change both in the face of the country and the manners of its inhabitants, that Gaul seemed to be translated into Greece, rather than a few

Greeks transplanted into Gaul." But though we may allow that the druids of Gaul and Britain borrowed some hints and embellishments of their philosophy from this Greek colony, and perhaps from other quarters, we have reason to believe that the substance of it was their own. Others have suggested, that the druids derived their philosophy from Pythagoras, who published his doctrines at Crotona in Italy; where he lived in the highest reputation for his virtue, wisdom, and learning, above 20 years. This conjecture is very much confirmed by this remarkable expression of Ammianus Marcellinus, "That the druids were formed into fraternities, as the authority of Pythagoras decreed." It hath been also observed, that the philosophy of the druids bore a much greater resemblance to that of Pythagoras than to that of any of the other sages of antiquity. But it seems probable, that Ammianus meant no more by the above expression than to illustrate the nature of the druidical fraternities, by comparing them to those of the Pythagoreans, which were well known to the Romans; and the resemblance between the Pythagorean and druidical philosophy may perhaps be best accounted for by supposing, that Pythagoras learned and adopted some of the opinions of the druids, as well as imparted to them some of his discoveries. It is well known, that this philosopher, animated by the most ardent love of knowledge, travelled into many countries in pursuit of it, and got himself admitted into every society that was famous for its learning. It is therefore highly probable in itself, as well as directly asserted by several authors, that Pythagoras heard the druids of Gaul, and was initiated into their philosophy.

From the concurring testimonies of several au-³ More partic-
thors, it appears that physiology, or natural philo-
sophy, was the favourite study of the druids of Gaul
and Britain. Cicero tells us, that he was personally
acquainted with one of the Gaulish druids, Diviti-
cus the *Æduan*, a man of quality in his country,
who professed to have a thorough knowledge of the
laws of nature, or that science which the Greeks
call *physics* or *physiolog*. According to Diodorus
Siculus, Strabo, Cæsar, Mela, Ammianus Marcel-⁴ *Physics, or*
linus, and others, they entered into many disqui-
sitions and disputations in their schools, concerning
the form and magnitude of the universe in general, and
of this earth in particular, and even concerning the
most sublime and hidden secrets of nature. On these
and the like subjects they formed a variety of systems
and hypotheses; which they delivered to their disciples
in verse, that they might the more easily retain them
in their memories, since they were not allowed to com-
mit them to writing. Strabo hath preserved one of
the physiological opinions of the druids concerning the
universe; *viz.* that it was never to be entirely destroyed
or annihilated; but was to undergo a succession of great
changes and revolutions, which were to be produced some-
times by the power and predominancy of water, and
sometimes by that of fire. This opinion, he intimates,
was not peculiar to them, but was entertained also
by the philosophers of other nations; and Cicero speaks
of it as a truth universally acknowledged and undeni-
able. "It is impossible for us (says he) to attain a
glory that is eternal, or even of very long duration, on
account of those deluges and conflagrations of the
S earth

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2
Their opi-
nions and
philosophy,
whence de-
rived.

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earth which must necessarily happen at certain periods." This opinion, which was entertained by the most ancient philosophers of many different and very distant nations, was probably neither the result of rational inquiry in all these nations, nor communicated from one of them to others; but defended to them all from their common ancestors of the family of Noah by tradition, but corrupted and misunderstood through length of time. The agreement of the druids with the philosophers of so many other nations in this opinion about the alternate dissolution and renovation of the world, gives us reason to believe, that they agreed with them also in their opinion of its origin from two distinct principles; the one intelligent and omnipotent, which was God; the other inanimate and inactive, which was matter. We are told by Cæsar, that they had many disquisitions about the power of God; and, no doubt, amongst other particulars, about his creating power. But whether they believed with some that matter was eternal, or with others that it was created; and in what manner they endeavoured to account for the disposition of it into the present form of the universe, we are entirely ignorant, though they certainly had their speculations on these subjects. We are only informed, that they did not express their sentiments on these and the like heads in a plain and natural, but in a dark, figurative, and enigmatical manner. This might incline us to suspect, that Pythagoras had borrowed from them his doctrine about numbers, to whose mythical energy he ascribes the formation of all things; for nothing can be more dark and enigmatical than that doctrine. The druids disputed likewise about the magnitude and form of the world in general, and of the earth in particular, of which things they pretended to have a perfect knowledge. We know not what their opinions were about the dimensions of the universe or of the earth, but we have several reasons to make us imagine that they believed both to be of a spherical form. This is visibly the shape and form of the sun, moon, and stars, the most conspicuous parts of the universe; from whence it was natural and easy to infer, that this was the form of the world and of the earth. Accordingly this seems to have been the opinion of the philosophers of all nations; and the circle was the favourite figure of the druids, as appears from the form both of their houses and places of worship. Besides these general speculations about the origin, dissolution, magnitude, and form of the world and of the earth, the druids engaged in particular inquiries into the natures and properties of the different kinds of substances. But all their discoveries in this most useful and extensive branch of natural philosophy, whatever they were, are entirely lost.

5
Astronomy.

Astronomy also appears to have been one of the chief studies of the druids of Gaul and Britain. "The druids (says Cæsar) have many disquisitions concerning the heavenly bodies and their motions, in which they instruct their disciples." Mela, speaking of the same philosophers, observes, "That they profess to have great knowledge of the motions of the heavens and of the stars." Some knowledge of this science indeed was not only necessary for measuring time in general, marking the duration of the different seasons, regulating the operations of the husbandman, directing the course of the mariner, and for

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many other purposes in civil life; but it was especially necessary for fixing the times and regular returns of their religious solemnities, of which the druids had the sole direction. Some of these solemnities were monthly, and others annual. It was therefore necessary for them to know, with some tolerable degree of exactness, the number of days in which the sun and moon performed their revolutions, that these solemnities might be observed at their proper seasons. This was the more necessary, as some of these solemnities were attended by persons from different and very distant countries, who were all to meet at one place on one day; who must have had some rule to discover the annual return of that day.

The most perceptible division of time by the two great luminaries is into day and night; the former occasioned by the presence of the sun above the horizon, the latter by his absence, which is in some measure supplied by the moon and stars. The druids computed their time by nights, and not by days; a custom which they had received from their most remote ancestors by tradition, and in which they were confirmed by their measuring their time very much by the moon, the mistress and queen of night. As the changes in the aspect of that luminary are most conspicuous, they engaged the attention of the most ancient astronomers of all countries, and particularly of the druids, who regulated all their great solemnities, both sacred and civil, by the age and aspect of the moon. "When no unexpected accident prevents it, they assemble upon stated days, either at the time of the new or full moon; for they believe these to be the most auspicious times for transacting all affairs of importance." Their most august ceremony of cutting the mistletoe from the oak by the archdruid, was always performed on the sixth day of the moon. Nay, they even regulated their military operations very much by this luminary, and avoided, as much as possible, to engage in battle while the moon was on the wane. As the attention of the druids was so much fixed on this planet, it could not be very long before they discovered that she passed through all her various aspects in about thirty days; and by degrees, and more accurate observations, they would find, that the real time of her performing an entire revolution was very nearly 29½ days. This furnished them with the division of their time into months, or revolutions of the moon; of which we know with certainty they were possessed. But this period, though of great use, was evidently too short for many purposes, and particularly for measuring the seasons; which they could not fail to perceive depended on the influences of the sun. By continued observation they discovered, that about 12 revolutions of the moon included all the variety of seasons, which begun again, and revolved every 12 months. This suggested to them that larger division of time called a year, consisting of 12 lunations, or 354 days, which was the most ancient measure of the year in almost all nations. That this was for some time at least the form of the druidical year, is both probable in itself, and from the following expression of Pliny: "That they began both their months and years, not from the change, but from the sixth day of the moon." This is even a demonstration that their years consisted of a certain number of lunar revolutions, as they always commenced on the same day

6
Their method of computing time.

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of the moon. But as this year of 12 lunar months falls 11 days and nearly one-fourth of a day short of a real revolution of the sun, this error would soon be perceived, and call for reformation; though we are not informed of the particular manner in which it was rectified. Various arguments might be collected to make it very probable that the Britons were acquainted with a year exact enough for every purpose of life, when they were first invaded by the Romans; but it will be sufficient to mention one, which is taken from the time and circumstances of that invasion. The learned Dr Halley hath demonstrated that Cæsar arrived in Britain, in his first year's expedition, on the 26th day of August: and Cæsar himself informs us, that at his arrival the harvest was finished, except in one field, which by some means or other was more backward than the rest of the country. This is a proof that the British husbandmen knew and used the most proper seasons for ploughing, sowing, and reaping. The druids, as we are told by Pliny, had also a cycle or period of 30 years, which they called an age, and which commenced likewise on the sixth day of the moon; but that author hath not acquainted us on what principles this cycle was formed, nor to what purposes it was applied. We can hardly suppose that this was the cycle of the sun, which consists of 28 years, and regulates the dominical letters. It is more probable, that while the druids made use of the year of 12 lunar months, and had not invented a method of adjusting it to the real revolution of the sun, they observed that the beginning of this year had passed through all the seasons, and returned to the point from whence it set out, in a course of about 33 years; which they might therefore call an age. Others may perhaps be of opinion, that this 30 years cycle of the druids is the same with the great year of the Pythagoreans, or a revolution of Saturn. Some have imagined that the druids were also acquainted with the cycle of 19 years, which is commonly called the cycle of the moon. But the evidence of this depends entirely on the truth of that supposition, that the Hyperborean island, which is described by Diodorus Siculus, was Britain, or some of the British isles. Among many other surprising things, that author says, concerning this Hyperborean island, "That its inhabitants believed that Apollo descended into their island at the end of every 19 years; in which period of time the sun and moon, having performed their various revolutions, return to the same point, and begin to repeat the same revolutions. This is called by the Greeks the great year, or the cycle of Meton."

7
Their
knowledge
of the stars.

We are told both by Cæsar and Mela, that the druids studied the stars as well as the sun and moon; and that they professed to know, and taught their disciples, many things concerning the motions of these heavenly bodies. From these testimonies we may conclude that the druids were acquainted with the planets, distinguished them from the fixed stars, and carefully observed their motions and revolutions. If this discovery was the result of their own observations, it would be gradual, and it would be a long time before they found out all the planets. They might perhaps have received some assistance and information from Pythagoras, or from some other quarter. But whether this discovery of the planets was their own, or communicated to them by others, it is highly probable that

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they were acquainted with the precise number of these wandering stars. Dio Cassius says, that the custom of giving the name of one of the planets to each of the seven days of the week was an invention of the Egyptians, and from them was gradually communicated to all the other nations of the world; and that in his time this custom was so firmly established, not only among the Romans, but among all the rest of mankind, that in every country it appeared to be a native institution. The knowledge of the planets, and perhaps the custom of giving their names to the days of the week, was brought out of Egypt into Italy by Pythagoras, more than 500 years before the beginning of the Christian era; and from thence it could not be very long before it reached Gaul and Britain. But though we have little or no reason to doubt that the druids knew the number and observed the motion of the planets, yet it may be questioned whether they had discovered the times in which they performed their several revolutions. Some of these stars, as Jupiter and Saturn, take so great a number of years in revolving, that it required a very extraordinary degree of patience and attention to discover the precise periods of their revolutions. If we could be certain that the island in which the ancients imagined Saturn lay asleep, was one of the British isles, as Plutarch intimates it was, we might be inclined to think that the British druids were not ignorant of the length of the period in which the planet Saturn performs a revolution. For that same author, in another treatise, tells us, "That the inhabitants of that island kept every thirtieth year a solemn festival in honour of Saturn, when his star entered into the sign of Taurus."

If we could depend upon the above testimony of Plutarch, we should have one positive proof that the druids of the British isles were acquainted with the constellations, and even with the signs of the zodiac; and that they measured the revolutions of the sun and planets, by observing the length of time between their departure from and return to one of these signs. But we have no direct evidence of this remaining in history.

The druids of Gaul and Britain, as well as the ancient philosophers of other countries, had a general plan or system of the universe, and of the disposition and arrangement of its various parts, in which they instructed their disciples. This is both probable in itself, and is plainly intimated by several authors of the greatest authority. But we cannot be certain whether this druidical system of the world was of their own invention, or was borrowed from others. If it was borrowed, it was most probably from the Pythagoreans, to whom they were the nearest neighbours, and with whom they had the greatest intercourse.

It hath been imagined, that the druids had instruments of some kind or other, which answered the same purposes with our telescopes, in making observations on the heavenly bodies. The only foundation of this very improbable conjecture is an expression of Diodorus Siculus, in his description of the famous Hyperborean island. They say further, that the moon is seen from that land, as if she was but at a little distance from the earth, and having hills or mountains like ours on her surface. But no such inference can be reasonably drawn from this expression, which in reality merits little more regard than what Strabo re-

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The application of the druids to the study of philosophy and astronomy amounts almost to a demonstration that they applied also to the study of arithmetic and geometry. For some knowledge of both these sciences is indispensably necessary to the physiologist and astronomer, as well as of great and daily life in the common affairs of life.

8

Arithmetic. If we were certain that ABARIS, the famous Hyperborean philosopher, the friend and scholar of Pythagoras, was really a British druid, as some have imagined, we should be able to produce direct historical evidence of their arithmetic knowledge. For Iamblicus, in the life of Pythagoras, says, " that he taught Abaris to find out all truth by the science of arithmetic." It may be thought improbable that the druids had made any considerable progress in arithmetic, as this may seem to be impossible by the mere strength of memory without the assistance of figures and of written rules. But it is very difficult to ascertain what may be done by memory alone, when it hath been long exercised in this way. We have had an

* See BERTON (Jesuitical). example in our own age, of a person * who could perform some of the most tedious and difficult operations in arithmetic by the mere strength of his memory. The want of written rules could be no great disadvantage to the druids, as the precepts of this, as well as of the other sciences, were couched in verse, which would be easily got by heart and long remembered. Though the druids were unacquainted with the Arabic characters which are now in use, we have no reason to suppose that they were destitute of marks or characters of some other kind, which, in some measure, answered the same purposes, both in making and recording their calculations. In particular, we have reason to think, that they made use of the letters of the Greek alphabet for both these purposes. This seems to be plainly intimated by Cæsar in the following expression concerning the druids of Gaul: " In almost all other public transactions, and private accounts or computations, they make use of the Greek letters." This is further confirmed by what the same author says of the Helvetii; a people of the same origin, language, and manners, with the Gauls and Britons. " Tables were found in the camp of the Helvetii written in Greek letters, containing an account of all the men capable of bearing arms, who had left their native country, and also separate accounts of the boys, old men, and women." There is historical evidence of the druids being also well acquainted with geometry. " When any disputes arise (says Cæsar) about their inheritances, or any controversies about the limits of their fields, they are entirely referred to the decision of their druids." But besides the knowledge of mensuration which this implies, both Cæsar and Mela plainly intimate that the druids were conversant in the most sublime speculations of geometry; " in measuring the magnitude of the earth, and even of the world."

9
Skill in mechanics.

There are still many monuments remaining in Britain and the adjacent isles, which cannot so reasonably be ascribed to any as to the ancient Britons, and which give us cause to think, that they had made

great progress in this useful part of learning, and could apply the mechanical powers so as to produce very astonishing effects. As these monuments appear to have been designed for religious purposes, we may be certain that they were erected under the direction of the druids. How many obelisks or pillars, of one rough unpolished stone each, are still to be seen in Britain and its isles? Some of these pillars are both very thick and lofty, erected on the summits of barrows and of mountains; and some of them (as at Stonehenge) have ponderous blocks of stone raised aloft, and resting on the tops of the upright pillars. We can hardly suppose that it was possible to cut these prodigious masses of stone (some of them above forty tons in weight) without wedges, or to raise them out of the quarry without levers. But it certainly required still greater knowledge of the mechanical powers, and of the method of applying them, to transport those huge stones from the quarry to the places of their destination; to erect the perpendicular pillars, and to elevate the impost to the tops of these pillars. If that prodigious stone in the parish of Constantine, Cornwall, was really removed by art from its original place, and fixed where it now stands (as one of our most learned and diligent antiquaries thinks it was †), it is a demonstration, that the druids could perform the most astonishing feats by their skill in mechanics. That the British druids were acquainted with the principles and use of the balance, we have good reason to believe, not only from the great antiquity of that discovery in other parts of the world, but also from some druidical monuments which are still remaining in this island. These monuments are called *Lagan stones*, or rocking stones; and each of them consists of one prodigious block of stone, resting upon an upright stone or rock, and so equally balanced, that a very small force, sometimes even a child, can move it up and down, though hardly any force is sufficient to remove it from its station. Some of these stones may have fallen into this position by accident, but others of them evidently appear to have been placed in it by art. That the ancient Britons understood the constitution and use of wheels, the great number of their war-chariots and other wheel-carriages is a sufficient proof; and that they knew how to combine them together and with the other mechanical powers, so as to form machines capable of raising and transporting very heavy weights, we have good reason to believe. In a word, if the British druids were wholly ignorant of the principles and use of any of the mechanical powers, it was most probably of the few, though even of this we cannot be certain.

10
Medicine. In Germany and in the northern nations of Europe the healing art was chiefly committed to the old women of every rate; but in Gaul and Britain it was intrusted to the druids, who were the physicians as well as the priests of these countries. Pliny says expressly, " That Tiberius Cæsar destroyed the druids of the Gauls, who were the poets and physicians of that nation;" and he might have added of the Britons. The people of Gaul and Britain were probably induced to devolve the care of their health on the druids, and to apply to these priests for the cure of their diseases, not only by the high esteem they had of their wisdom and learning, but also by the opinion which they entertained,

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+ Dr BERTON's Antiquary, Cornwall, p. 174, 175.

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tertained, that a very intimate connection subsisted between the arts of healing and the rites of religion; and that the former were most effectual when they were accompanied by the latter. It appears indeed to have been the prevailing opinion of all the nations of antiquity, that all internal diseases proceeded immediately from the anger of the gods; and that the only way of obtaining relief from these diseases was by applying to their priests to appease their anger by religious rites and sacrifices. This was evidently the opinion and practice of the Gauls and Britons, who in some dangerous cases sacrificed one man as the most effectual means of curing another. "They are much addicted (says Cæsar) to superstition; and for this cause, those who are afflicted with a dangerous disease sacrifice a man, or promise that they will sacrifice one, for their recovery. For this purpose they make use of the ministry of the druids; because they have declared, that the anger of the immortal gods cannot be appeased, so as to spare the life of one man but by the life of another." This way of thinking gave rise also to that great number of magical rites and incantations with which the medical practices of the druids, and indeed of all the physicians of antiquity, were attended. "No body doubts (says Pliny) that magic derived its origin from medicine, and that by its flattering but delusive promises, it came to be esteemed the most sublime and sacred part of the art of healing."

11
Botany.

That the druids made great use of herbs for medicinal purposes, we have sufficient evidence. They not only had a most superstitious veneration for the mistletoe of the oak, on a religious account, but they also entertained a very high opinion of its medical virtues, and esteemed it a kind of panacea or remedy for all diseases. "They call it (says Pliny) by a name which in their language signifies *Albeal*, because they have an opinion that it cureth all diseases." They believed it to be in particular a specific against barrenness, and a sovereign antidote against the fatal effects of poisons of all kinds. 'It was esteemed also an excellent emollient and discutient for softening and discussing hard tumors; good for drying up scrophulous sores; for curing ulcers and wounds; and (provided it was not suffered to touch the earth after it was cut) it was thought to be a very efficacious medicine in the epilepsy or falling-sickness. It hath been thought useful in this last calamitous disease by some modern physicians. The pompous ceremonies with which the mistletoe was gathered by the druids have been already described. The selago, a kind of hedge hyssop resembling fawn, was another plant much admired by the druids of Gaul and Britain for its supposed medicinal virtues, particularly in all diseases of the eyes. But its efficacy, according to them, depended very much upon its being gathered exactly in the following manner: The person who gathered it was to be clothed in a white robe, to have his feet bare, and washed in pure water; to offer a sacrifice of bread and wine before he proceeded to cut it; which he was to do with his right hand covered with the skirt of his garment, and with a hook of some more precious metal than iron. When it was cut, it was to be received into, and kept in a new and very clean cloth. When it was gathered exactly according to this whimsical ritual, they affirmed that it was not only an excellent medicine, but also a

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powerful charm and preservative from misfortunes and unhappy accidents of all kinds. They entertained a high opinion also of the herb Samolus or marshwort, for its sanative qualities; and gave many directions for the gathering it, no less fanciful than those above mentioned. The person who was to perform that office was to do it fasting, and with his left hand; he was on no account to look behind him, nor to turn his face from the herbs he was gathering. It would be tedious to relate the extravagant notions they entertained of the many virtues of the vervain, and to recount the ridiculous mummeries which they practised in gathering and preparing it, both for the purposes of divination and physic. These things may be seen in Plin. Hist. Nat. l. 25. c. 9. from whence we have received all these anecdotes of the botany of the druids. It is easy to see that his information was very imperfect; and that, like many of the other Greek and Roman writers, he designedly represents the philosophers of Gaul and Britain in an unfavourable light. The herb which was called *Britannica* by the ancients, which some think was the great water-dock, and others the cochlearea or scurvy-grass, was probably much used in this island for medical purposes; as it derived its name from hence, and was from hence exported to Rome and other parts. Though these few imperfect hints are all that we can now collect of the botany of the British druids, yet we have some reason to think that they were not contemptible botanists. Their circumstances were peculiarly favourable for the acquisition of this kind of knowledge. For as they spent most of their time in the recesses of mountains, groves, and woods, the spontaneous vegetable productions of the earth constantly presented themselves to their view, and courted their attention.

The opinions which, it is said, the druids of Gaul and Britain entertained of their anguim or serpents egg, both as a charm and as a medicine, are romantic and extravagant in a very high degree. This extraordinary egg was formed, as they pretended, by a great number of serpents interwoven and twined together; and when it was formed, it was raised up in the air by the hissing of these serpents, and was to be caught in a clean white cloth, before it fell to the ground. The person who caught it was obliged to mount a swift horse, and to ride away at full speed to escape from the serpents, who pursued him with great rage, until they were stopped by some river. The way of making trial of the genuineness of this egg was no less extraordinary. It was to be enshafed in gold, and thrown into a river, and if it was genuine it would swim against the stream. "I have seen (says Pliny) that egg; it is about the bigness of a moderate apple, its shell is a cartilaginous incrustation, full of little cavities, such as are on the legs of the polypus; it is the insignia, or badge of distinction of the druids." The virtues which they ascribed to this egg were many and wonderful. It was particularly efficacious to render those who carried it about with them superior to their adversaries in all disputes, and to procure them the favour and friendship of great men. Some have thought that this whole affair of the serpents egg was a mere fraud, contrived by the druids, to excite the admiration and pick the pockets of credulous people, who purchased these wonder-working eggs from them.

at

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at a high price. Others have imagined that this story of the anguinus (of which there is an ancient monument in the cathedral at Paris) was an emblematical representation of the doctrine of the druids concerning the creation of the world. The serpents, say they, represent the Divine Wisdom forming the universe, and the egg is the emblem of the world formed by that Wisdom. It may be added, that the virtue ascribed to the anguinus, of giving those who possessed it a superiority over others, and endearing them to great men, may perhaps be intended to represent the natural effects of learning and philosophy. But in so doubtful a matter every one is at full liberty to form what judgment he thinks proper.

12
Rhetoric.

As the influence and authority of the druids in their country depended very much upon the reputation of their superior wisdom and learning, they wisely applied to the study of those sciences which most directly contributed to the support and advancement of that reputation. In this number, besides those already mentioned, we may justly reckon rhetoric, which was diligently studied and taught by the druids of Gaul and Britain; who to the charms of their eloquence were indebted for much of the admiration and authority which they enjoyed. They had indeed many calls and opportunities to display their eloquence, and to discover its great power and efficacy; as, when they were teaching their pupils in their schools, when they discoursed in public to the people on religious and moral subjects, when they pleaded causes in the courts of justice, and when they harangued in the great councils of the nation, and at the heads of armies ready to engage in battle; sometimes with a view to inflame their courage, and at other times with a design to allay their fury, and dispose them to make peace. Though this last was certainly a very difficult task among fierce and warlike nations, yet such was the authority and eloquence of the druids that they frequently succeeded in it. "They pay a great regard (says Diodorus Siculus) to their exhortations, not only in the affairs of peace, but even of war, and these are respected both by their friends and enemies. They sometimes step in between two hostile armies, who are standing with their swords drawn and their spears extended, ready to engage; and by their eloquence, as by an irresistible enchantment, they prevent the effusion of blood, and prevail upon them to sheath their swords. So great are the charms of eloquence and the power of wisdom, even among the most fierce barbarians." The British kings and chieftains, who were educated by the druids, were famous for their eloquence. This is evident from the many noble speeches which are ascribed to them by the Greek and Roman writers. For though these speeches may not be genuine, yet they are a proof that it was a well-known fact that these princes were accustomed to make harangues on these and the like occasions. This we are expressly told by Tacitus. "The British chieftains, before a battle, fly from rank to rank, and address their men with animating speeches, tending to inflame their courage, increase their hopes, and dispel their fears." These harangues were called, in the ancient language of Britain, *Brofnechy Kab*, which is literally translated by Tacitus *Incentimenta Brili*, "incentives to war." The genuine posterity of the ancient Britons

long retained their taste for eloquence, and their high esteem for those who excelled in that art. "Orators (says Mr Martin) were in high esteem, both in these islands (the *Æbude*) and the continent, until within these forty years. They sat always among the nobles or chiefs of families in the *streat* or circle. Their houses and little villages were sanctuaries, as well as churches, and they took place before doctors of physic. The orators, after the druids were extinct, were brought in to preserve the genealogy of families, and to repeat the fame at every succession of a chief; and upon the occasion of marriages and births, they made epithalamiums and panegyrics, which the poet or bard pronounced. The orators, by the force of their eloquence, had a powerful ascendancy over the greatest men in their time. For if any orator did but ask the habit, arms, horse, or any other thing belonging to the greatest man in these islands, it was readily granted him; sometimes out of respect, and sometimes for fear of being exclaimed against by a satyr, which in those days was reckoned a great dishonour."

Druids.

If the British druids, considering the times in which they lived, had made no contemptible proficiency in several parts of real and useful learning; it cannot be denied that they were also great pretenders to superior knowledge in certain vain fallacious sciences, by which they excited the admiration, and took advantage of the ignorance and credulity of mankind. These were the sciences (if they may be so called) of magic and divination; by which they pretended to work a kind of miracles, and exhibit astonishing appearances in nature; to penetrate into the counsels of heaven; to foretell future events, and to discover the success or miscarriage of public or private undertakings. Their own countrymen not only believed that the druids of Gaul and Britain were possessed of these powers, but they were celebrated on this account by the philosophers of Greece and Rome. "In Britain (says Pliny) the magic arts are cultivated with such astonishing success, and so many ceremonies at this day, that the Britons seem to be capable of instructing even the Persians themselves in these arts. They pretend to discover the designs and purposes of the gods. The *Eubates* or *Vates* in particular investigate and display the most sublime secrets of nature; and, by auspices and sacrifices, they foretell future events." They were so famous for the supposed veracity of their predictions, that they were not only consulted on all important occasions by their own princes and great men, but even sometimes by the Roman emperors. Nor is it very difficult to account for all this. The druids finding that the reputation of their magical and prophetic powers contributed not a little to the advancement of their wealth and influence, they endeavoured, no doubt, to strengthen and establish it by all their art and cunning. Their knowledge of natural philosophy and mechanics enabled them to execute such works, and to exhibit such appearances, or to make the world believe that they did exhibit them, as were sufficient to gain them the character of great magicians. The truth is, that nothing is more easy than to acquire this character in a dark age, and among an unenlightened people. When the minds of men are haunted with dreams of charms and enchantments, they are apt to fancy that the most common occurrences

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Magic and divination.

occurrences

Druids.

currences in nature are the effects of magical arts. The following strange story, which we meet with in Plutarch's *Treatise of the Cessation of Oracles*, was probably occasioned by something of this kind. "There are many islands which lie scattered about the isle of Britain, after the manner of our Sporades. They are generally unpeopled, and some of them are called the *Islands of the Heroes*. One Demetrius was sent by the emperor (perhaps Claudius) to discover those parts. He arrived at one of these islands (supposed by some to be Anglesey, but more probably one of *Æbudæ*) next adjoining to the isle of Britain before mentioned, which was inhabited by a few Britons, who were esteemed sacred and inviolable by their countrymen. Immediately after his arrival the air grew black and troubled, and strange apparitions were seen; the winds rose to a tempest, and fiery spouts and whirlwinds appeared dancing towards the earth." This was probably no more than a storm of wind, accompanied with rain and lightning; a thing neither unnatural nor uncommon: but Demetrius and his companions having heard that the British druids, by whom this isle was chiefly inhabited, were great magicians, they imagined that it was raised by them; and fancied that they saw many strange unnatural sights. The druids did not think proper to undeceive them; for when they enquired at them about the cause of this storm, they told them it was occasioned by the death of one of those invisible beings or genii who frequented their isle. A wonderful and artful tale, very well calculated to encrease the superstitious terrors of Demetrius and his crew; and to determine them to abandon this enchanted isle, with a resolution never to return. Stonehenge, and several other works of the druids, were believed to have been executed by the arts of magic and enchantment, for many ages after the destruction of their whole order: nor is it improbable that they persuaded the vulgar in their own times to entertain the same opinion of these works, by concealing from them the real arts by which they were performed. The natural and acquired sagacity of the druids, their long experience, and great concern in the conduct of affairs, enabled them to form very probable conjectures about the events of enterprises. These conjectures they pronounced as oracles, when they were consulted; and they pretended to derive them from the inspection of the entrails of victims, the observation of the flight and feeding of certain birds, and many other mummeries. By these, and the like arts, they obtained and preserved the reputation of prophetic foresight among an ignorant and credulous people. But these pretensions of the druids to magic and divination, which contributed so much to the advancement of their fame and fortune in their own times, have brought very heavy reproaches upon their memory, and have made some learned moderns declare that they ought to be expunged out of the catalogue of philosophers, and esteemed no better than mere cheats and jugglers. This censure is evidently too severe, and might have been pronounced with equal justice upon all the ancient philosophers of Egypt, Assyria, Persia, Greece, and Rome; who were great pretenders to magic and divination, as well as our druids. "I know of no nation in the world (says Cicero), either so polite and learned, or so savage and

barbarous, as not to believe that future events are prefigured to us, and may by some men be discovered and foretold." The only conclusion therefore that can be fairly drawn, from the successful pretensions of the British druids to the arts of magic and divination, is this—That they had more knowledge than their countrymen and contemporaries; but had not so much virtue to resist the temptation of imposing upon their ignorance, to their own advantage.

DRUM, is a martial musical instrument in form of a cylinder, hollow within, and covered at the two ends with vellum, which is stretched or slackened at pleasure by the means of small cords or sliding knots. It is beat upon with sticks. Drums are sometimes made of brass, but most commonly they are of wood.—The drum is by Le Clerc said to have been an oriental invention, and to have been brought by the Arabians, or perhaps rather the Moors, into Spain.

Kettle Drums, are two sorts of large bassons of copper or brass, rounded in the bottom, and covered with vellum or goat skin, which is kept fast by a circle of iron round the body of the drum, with a number of screws to screw up and down. They are much used among the horse; as also in operas, oratorios, concerts, &c.

DRUM, or *Drummer*, he that beats the drum; of whom each company of foot has one, and sometimes two. Every regiment has a drum-major, who has the command over the other drums. They are distinguished from the soldiers by cloaths of a different fashion: their pole, when a battalion is drawn up, is on the flanks, and on a march it is betwixt the divisions.

Drum of the Ear, the same with the *tympanum*. See ANATOMY, n^o 141.

DRUMMOND (William), a polite writer, born in Scotland in 1585, was the son of Sir John Drummond, who for ten or twelve years was usher and afterwards knight of the black rod to James VI. His family became first distinguished by the marriage of Robert III. whose queen was sister to William Drummond of Carnock their ancestor; as appears by the patents of that king and James I. the one calling him "our brother," the other "our uncle."

Drummond was educated at Edinburgh, where he took the degree of A. M. In 1606 he was sent by his father to study civil law at Bourges in France: but having no taste for the profession of a lawyer, he returned to Scotland, and retired to his agreeable seat at Hawthornden; where he applied himself with great assiduity to classical learning and poetry, and obliged the world with several fine productions. Here he wrote his *Cypress Grove*, a piece of excellent prose, after a dangerous fit of sickness; and about the same time, his *Flowers of Sion*, in verse. But an accident befel him, which obliged him to quit his retirement; and that was the death of an amiable lady to whom he was just going to be married. This affected him so deeply, that he went to Paris and Rome, between which two places he resided eight years. He travelled also thro' Germany, France, and Italy: where he visited universities; conversed with learned men; and made a choice collection of the ancient Greek, and of the modern Spanish, French, and Italian books. He then returned to his native country; and some time thereafter married.

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married Margaret Logan, a grand-daughter of Sir Robert Logan. Upon the appearance of a civil war, he retired again; and in this retirement is supposed to have written his history of the Five James's, successively kings of Scotland, which was not published till after his death. Having been grafted as it were on the royal family of Scotland, and upheld by them, he was steadily attached to Charles I.; but does not appear ever to have armed for him. As he had always been a laborious student, and had applied himself equally to history and politics as to classical learning, his services were better rendered by occasional publications, in which he several times distinguished himself. In a piece called *Irene*, he harangues the king, nobility, and clergy, about their mutual mistakes, fears, and jealousies; and lays before them the consequences of a civil war, from indisputable arguments and the histories of past times. The great Marquis of Montrose wrote a letter to him, desiring him to print this *Irene*, as the best means to quiet the minds of a distracted people: he likewise sent him a protection dated August 1645, immediately after the battle of Kilsyth, with a letter, in which he commends Mr Drummond's learning and loyalty. Mr Drummond wrote other things also with the same view of promoting peace and union, of calming the disturbed minds of the people, of reasoning the better sort into moderation, and checking the growing evils which would be the consequence of their obstinacy. But his efforts were fruitless; and his attachment to the king and his cause were so strong, that when he heard of the sentence being executed on him, he was overwhelmed with grief, and lifted his head no more. He died in the year 1649, leaving behind him several children: the eldest of whom, William, was knighted by Charles II. He had a great intimacy and correspondence with the two famous English poets, Michael Drayton and Ben Jonson; the latter of whom, at the age of 45, travelled from London on foot, to visit him at Hawthornden. An edition of his works, with his life prefixed, was printed in folio at Edinburgh, 1711.

Among all the writers, at the beginning of the last century, who flourished after the death of Shakespeare, an ingenious critic† observes, there is not one whom a general reader of the English poetry of that age will regard with so much and so deserved attention as William Drummond. In a survey of his poetry, two considerations must be had, *viz.* the nation of which he was, and the time when he wrote. Yet will these be found not offered to extenuate faults, but to increase admiration. His thoughts are often, nay generally, bold and highly poetical: he follows nature, and his verses are delicately harmonious. As his poems are not easily met with, and have perhaps by many readers never been heard of, a few extracts may be excused.

On the death of Henry prince of Wales in 1612, Drummond wrote an elegy intitled *Tears on the Death of Mœliades*; a name which that prince had used in all his challenges of martial sport, as the anagram of *Miles a Deo*. In this poem are lines, according to Denham's terms, as strong, as deep, as gentle, and as full, as any of his or Waller's. The poet laments the fate of the prince, that he died not in some glorious cause of war: "against the Turk (he says) thou hadst ended thy life and the Christian war together;"

Or, as brave Bourbon, thou hadst made old Rome,
Queen of the world, thy triumph and thy tomb.

Of the lamentation of the river Forth:

And as the ruth'd her Cycloades among,
She seem'd to plain that Heaven had done her wrong.

Further:

Tagus did court his love with golden dreams,
Rhine with her towers, fair Seine with all the claims:
But ah, poor lovers! death did them betray;
And, unsuspected, made their hopes his prey.

And concludes:

The virgins to thy tomb will garlands bear
Of flow'rs, and with each flow'r let fall a tear.
Mœliades! sweet courtly nymphs deplore,
From Thule to Hydæpes' pearly shore.

Perhaps there are no lines of Pope of which the easy flow may be more justly admired than of those in his third pastoral:

Nat bubbling fountains to the thirsty swain,
Not balmy sleep to lab'ers faint with pain,
Nor show'rs to larks, or sun-flime to the bee,
Are half so charming as thy light to me.

When King James I. after his accession to the English throne, returned to Scotland in 1617, his arrival was celebrated by every effort of poetical congratulation. Upon this occasion Drummond composed a panegyric intitled *The Wandering Muses, or the River Forth feasting*; in which are found four lines apparently imitated by Pope in the above passage, and which do not in point of harmony fall much short of that imitation. He says,

To virgins, flow'rs; to fun-burnt earth, the rain;
To mariners, fair winds amidst the main;
Cool shades, to pilgrims whom hot glances burn;
Are not so pleasing as thy blest return.

Of these two poems of Drummond, it is observable, that the first was written in 1612, the last in 1617. The earliest piece of Waller is that to the king on his navy in 1625. The piece in which Sir John Denham's greatest force lies, Cooper's Hill, was not written till 1640. The harmony of Drummond, therefore, at a time when those who are usually called the first introducers of a smooth and polished versification had not yet begun to write, is an honour to him that should never be forgotten. Nor is his excellence half enough praised or acknowledged.

Drummond and Petrach had this in common, that each lamented, first the cruelty, and then the loss of his mistress; so that their sonnets are alike naturally divided into two parts, those before and those after their several mistresses deaths. It may justly be doubted, that among all the sonneteers in the English language any one is to be preferred to Drummond. He has shown in some of these compositions nearly the spirit of Petrach himself. Of each period one is here inserted; the first, before the death of his mistress:

Ah me, and am I now the man, whose muse
In happier times was wont to laugh at love,
In those who suffered that blind boy abuse
The noble gifts were giv'n them from above!

What metamorphose strange is this! I prove?
Myself I scarce now find myself to be;
And think no fable Circe's tyrannic,
And all the tales are told of changed Jove.

† *Cursory
Remarks on
some of the
English
Poets*, 8vo.
1789.

Bruids,
Drunkenn-
ness.

Virtue hath taught, with her philosophy,
My mind unto a better course to move;
Reason may chide her full, and oft reprove
Affection's power; but what is that to me,
Who ever think, and never think on aught
But that bright cherubim which thralls my thought!

From Part II. after her death, (Sonnet I.)

Of mortal glory, O foon dark'ned ray!
O winged joys of man, more swift than wind!
O fond desires which in our fancies fray!
O traitorous hopes which do our judgments blind!
Lo, in a flash that light is gone away,
Which dazzle'd did each eye, delight each mind;
And with that fun from whence it came combu'd,
Now makes more radiant heav'n's eternal day.
Let Beauty now bedew her cheeks with tears;
Let widow'd Music only roar and groan;
Poor Virtue, get thee wings and mount the spheres,
For dwelling-place on earth for thee is none:
Death hath thy temple raz'd, Love's empire foil'd,
The world of honour, worth, and sweetness spoil'd.

The seventh sonnet of the first part has much resemblance to Sir Henry Wotton's elegant little poem on the Queen of Bohemia, "Ye meaneer beauties," &c. Among Drummond's Flowers of Sion, the poem which begins "Amidst the azure clear—of Jordan's sacred streams," eminently distinguishes him, whether he be considered as a philosopher or a poet.

DRUNKENNESS, a well known disorder in the brain, occasioned by drinking too freely of spirituous liquors. Drunkenness appears in different shapes in different constitutions: some it makes gay, some sullen, and some furious. The mischief of drunkenness consists in the following bad effects: 1. It betrays most constitutions either into extravagancies of anger, or sins of lewdness. 2. It disqualifies men for the duties of their station, both by the temporary disorder of their faculties, and at length by a constant incapacity and stupefaction. 3. It is attended with expences, which can often be ill spared. 4. It is sure to occasion uneasiness to the family of the drunkard. 5. It shortens life. To these consequences of drunkenness must be added the peculiar danger and mischief of the example. "Drunkenness (Mr Paley observes) is a social festive vice. The drinker collects his circle; the circle naturally spreads; of those who are drawn within it, many become the corrupters and centres of sets and circles of their own; every one countenancing, and perhaps emulating the rest, till a whole neighbourhood be infected from the contagion of a single example. With this observation upon the spreading quality of drunkenness, may be connected a remark which belongs to the several evil effects above recited. The consequences of a vice, like the symptoms of a disease, though they be all enumerated in the description, seldom all meet in the same subject. In the instance under consideration, the age and temperature of one drunkard may have little to fear from inflammations of lust or anger; the fortune of a second may not be injured by the expence; a third may have no family to be disquieted by his irregularities; and a fourth may possess a constitution fortified against the poison of strong liquors. But if, as we always ought to do, we comprehend within the consequences of our conduct the mischief and tendency of the example, the above circumstances, however fortunate for the individual, will be found to vary the guilt of his intemperance less, probably, than he sup-

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poses. Although the waste of time and money may be of small importance to you, it may be of the utmost to some one or other whom your society corrupts. Repeated, or long continued excesses, which hurt not your health, may be fatal to your companion. Although you have neither wife nor child, nor parent, to lament your absence from home, or expect your return to it with terror; other families, whose husbands and fathers have been invited to share in your ebriety, or encouraged to imitate it, may justly lay their misery or ruin at your door. This will hold good, whether the person seduced be seduced immediately by you, or the vice be propagated from you to him, through several intermediate examples."

The ancient Lacedæmonians used to make their slaves frequently drunk, to give their children an aversion and horror for the fame. The Indians hold drunkenness a species of madness; and in their language, the same term (*ramgam*), that signifies "drunkard," signifies also a "phreneticus."

Drunkenness is repeatedly forbidden by St Paul: "Be not drunk with wine, wherein is excess." "Let us walk honestly as in the day, not in rioting and drunkenness." "Be not deceived: neither fornicators, nor drunkards, nor revilers, nor extortioners, shall inherit the kingdom of God." Eph. v. 18. Rom. xiii. 13. 1. Cor. vi. 9, 10. The same apostle likewise condemns drunkenness, as peculiarly inconsistent with the Christian profession: "They that be drunken, are drunken in the night; but let us, who are of the day, be sober." 1. Thess. v. 7, 8.

Drunkenness, by our laws, is looked upon as an aggravation rather than an excuse for any criminal behaviour. A drunkard, says Sir Edward Coke, who is *voluntarius demon*, hath no privilege thereby; but what hurt or ill soever he doth, his drunkenness doth aggravate it: *nam omne crimen ebrietas, et incendit, et detegit*. It hath been observed that the real use of strong liquors, and the abuse of them by drinking to excess, depend much upon the temperature of the climate in which we live. The same indulgence which may be necessary to make the blood move in Norway, would make an Italian mad. A German therefore, says the president Montequieu, drinks through custom founded upon constitutional necessity; a Spaniard drinks through choice, or out of the mere wantonness of luxury; and drunkenness, he adds, ought to be more severely punished where it makes men mischievous and mad, as in Spain and Italy, than where it only renders them stupid and heavy, as in Germany and more northern countries. And accordingly, in the warmer climate of Greece, a law of Pittacus enacted, "that he who committed a crime when drunk, should receive a double punishment;" one for the crime itself, and the other for the ebriety which prompted him to commit it. The Roman law indeed made great allowances for this vice: *per vinum delapsis capitalis poena remittitur*. But the law of England, considering how easy it is to counterfeit this excuse, and how weak an excuse it is (though real), will not suffer any man thus to privilege one crime by another.

For the offence of drunkenness a man may be punished in the ecclesiastical court, as well as by justices of peace by statute. And by 4 Jac. I. c. 5, and 21 Jac. I. c. 7. if any person shall be convicted of drunkenness

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drunkenness by the view of a justice, oath of one witness, &c. he shall forfeit 5s. for the first offence; to be levied by distress and sale of his goods; and for want of a distress, shall sit in the stocks six hours; and, for the second offence, he is to be confined with two felons in a cell, to be of good behaviour, or to be committed. And he who is guilty of any crime thro' his own voluntary drunkenness, shall be punished for it as if he had been sober. It has been held that drunkenness is a sufficient cause to remove a magistrate: and the prosecution for this offence by the statute of 4 Jac. 1. c. 5. was to be, and still may be, before justices of peace in their sessions by way of indictment, &c. Equity will not relieve against a bond, &c. given by a man when drunk, unless the drunkenness is occasioned through the management or contrivance of him to whom the bond is given.

The appetite for intoxicating liquors appears to be almost always acquired. One proof of which is, that it is apt to return only at particular times and places; as after dinner, in the evening, on the market day, at the market town, in such a company, at such a tavern. And this may be the reason, that if a habit of drunkenness be ever overcome, it is upon some change of place, situation, company, or profession. A man sunk deep in a habit of drunkenness, will upon such occasions as these, when he finds himself loosened from the associations which held him fast, sometimes make a plunge, and get out. In a matter of such great importance, it is well worth while, where it is tolerably convenient, to change our habitation and society, for the sake of the experiment.

Habits of drunkenness commonly take their rise either from a fondness for and connection with some company, or some companion, already addicted to this practice; which affords an almost irresistible invitation to take a share in the indulgencies which those about us are enjoying with so much apparent relish and delight; or from want of regular employments, which is sure to let in many superfluous cravings and customs, and often this amongst the rest; or, lastly, from grief or fatigue, both which strongly solicit that relief which inebriating liquors administer for the present, and furnish a specious excuse for complying with the inclination. But the habit, when once let in, is continued by different motives from those to which it owes its origin. Persons addicted to excessive drinking suffer, in the intervals of sobriety, and near the return of their accustomed indulgence, a faintness and oppression about the *præcordia* which it exceeds the ordinary patience of human nature to endure. This is usually relieved for a short time by a repetition of the same excess: and to this relief, as to the removal of every long continued pain, they who have once experienced it are urged almost beyond the power of resistance. This is not all: as the liquor loses its stimulus, the dose must be increased, to reach the same pitch of elevation or ease; which increase proportionably accelerates the progress of all the maladies that drunkenness brings on. Whoever reflects, therefore, upon the violence of the craving in advanced stages of the habit, and the fatal termination to which the gratification of it leads, will, the moment he perceives the least tendency in himself of a growing inclination to intemperance, collect his resolution to this point; or (what perhaps he

will find his best security) arm himself with some peremptory rule, as to the times and quantity of his indulgencies.

DRUPA, or DRUPPA, in botany, a species of *pericarpium* or seed-vessel, which is succulent or pulpy, has no valve or external opening like the capsule and pod, and contains within its substance a stone or nut. The cherry, plum, peach, apricot, and all other stone-fruit are of this kind.

The term, which is of great antiquity, is synonymous to Tournefort's *fructus molli osculo*, "soft fruit with a stone;" and to the *prunus* of other botanists.

The stone or nut, which in this species of fruit is surrounded by the soft pulpy flesh, is a kind of ligneous or woody cup, which contains a single kernel or seed.

This definition, however, will not apply to every feed-vessel denominated *drupa* in the *Genera Plantarum*. The almond is a *drupa*, so is the seed-vessel of the elm-tree and the genus *rumbia*, though far from being pulpy or succulent; the first and third are of a substance like leather, the second like parchment. The same may be said of the walnut, pistachia-nut, *guettarda*, *quifqualis*, jack-in-a-box, and other others.

Again, the seeds of the elm, *schœbera*, *flagellaria*, and the mango-tree, are not contained in a stone. The seed-vessel of burr-reed is dry, shaped like a top, and contains two angular stones.

This species of fruit, or more properly seed-vessel, is commonly roundish, and when seated below the calyx or receptacle of the flower, is furnished, like the apple, at the end opposite to the foot-stalk, with a small umbilicus or cavity, which is produced by the swelling of the fruit before the falling off of the flower-cup.

DRUSES, or DRUZES, a remarkable nation in Palestine, inhabiting the environs of Mount Lebanon, of whose origin and history we have the following detail by M. Volney.

Twenty-three years after the death of Mahomet, the disputes between Ali his son-in-law and Moaouia governor of Syria, occasioned the first schism in the empire of the Arabs, and the two sects subsist to this day: but, in reality, this difference related only to power; and the Mahometans, however divided in opinion respecting the rightful successor of the prophet, were agreed with respect to their dogmas. It was not until the following century that the perusal of Greek books introduced among the Arabs a spirit of discussion and controversy, to which till then they were utter strangers. The consequence was, as might be expected, by reasoning on matters not susceptible of demonstration, and guided by the abstract principles of an unintelligible logic, they divided into a multitude of sects and opinions. At this period, too, the civil power lost its authority; and religion, which from that derives the means of preserving its unity, shared the same fate, and the Mahometans now experienced what had before befallen the Christians. The nations which had received the religion of Mahomet, mixed with it their former absurd notions; and the errors which had anciently prevailed over Asia again made their appearance, though altered in their forms. The metempsychosis, the doctrine of a good and evil principle, and the renovation after six thousand years, as it had been taught by Zoroaster, were again revived among the Mahometans.

Drupa, Druces.

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Mahometans. In this political and religious confusion, every enthusiast became an apostle, and every apostle the head of a sect. No less than sixty of these were reckoned, remarkable for the numbers of their followers, all differing in some points of faith, and all disavowing heresy and error. Such was the state of these countries when at the commencement of the 11th century Egypt became the theatre of one of the most extravagant scenes of enthusiasm and absurdity ever recorded in history. The following account is extracted from the eastern writers.

In the year of the Hejira 386 (A. D. 996), the third caliph of the race of the Fatmides, called *Hakem-b'Amr-ellah*, succeeded to the throne of Egypt at the age of 41 years. He was one of the most extraordinary princes of whom history has preserved the memory. He caused the first caliphs, the companions of Mahomet, to be cursed in the mosques, and afterwards revoked the anathema; He compelled the Jews and Christians to abjure their religion, and then permitted them to resume it. He prohibited the making of slippers for women, to prevent them from coming out of their houses. He burnt one half of the city of Cairo for his diversion, while his soldiers pillaged the other. Not contented with these extravagant actions, he forbade the pilgrimage to Mecca, fasting, and the five prayers; and at length carried his madness so far as to desire to pass for God himself. He ordered a register of those who acknowledged him to be so, and the number amounted to sixteen thousand. This impious pretension was supported by a false prophet, who came from Persia into Egypt; which impostor, named *Mohammad-ben-Ismael*, taught that it was not necessary to fast or pray, to practise circumcision, to make the pilgrimage to Mecca, or observe festivals; that the prohibition of pork and wine was absurd; and that marriage between brothers and sisters, fathers and children, was lawful. To ingratiate himself with Hakem, he maintained that this caliph was God himself incarnate; and instead of his name *Hakem-b'Amr-ellah*, which signifies *governing by the order of God*, he called him *Hakem-b'Amr-el*, *governing by his own order*. Unluckily for the prophet, his new god had not the power to protect him from the fury of his enemies, who slew him in a tumult almost in the arms of the caliph, who was himself massacred soon after on mount Mokattam, where he, as he said, had held conversation with angels.

The death of these two chiefs did not stop the progress of their opinions: a disciple of Mohammad-ben-Ismael, named *Hamza-ben-Ahmad*, propagated them with an indefatigable zeal in Egypt, in Palestine, and along the coast of Syria, as far as Sidon and Bergtus. His proselytes being persecuted by the sect in power, they took refuge in the mountains of Lebanon, where they were better able to defend themselves; at least it is certain, that, shortly after this era, we find them established there, and forming an independent society.

The difference of their opinions disposes them to be enemies; but the urgent interest of their common safety forces them to allow mutual toleration, and they have always appeared united, and have jointly opposed, at different times, the Crusaders, the sultans of Aleppo, the Mamlouks, and the Ottomans. The conquest of Syria by the latter, made no change in their situation. Schin I. on his return from Egypt, meditating

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no less than the conquest of Europe, disdained to waste his time before the rocks of Lebanon. Soliman II. his successor, incessantly engaged in important wars, either with the knights of Rhodes, the Persians, the kingdom of Yemen, the Hungarians, the Germans, or the emperor Charles V. had no time to think of the Druzes. Emboldened by this inattention, and not content with their independence, they frequently descended from their mountains to pillage the Turks. The pachas in vain attempted to repel their inroads; their troops were invariably routed or repulsed. And it was not till the year 1588 that Amurath III. wearied with the complaints made to him, resolved, at all events, to reduce these rebels, and had the good fortune to succeed. His general Ibrahim Pacha marched from Cairo, and attacked the Druzes and Maronites with so much address and vigour as to force them into their strong holds, the mountains. Diffusion took place among their chiefs, of which he availed himself to exact a contribution of upwards of one million of piastras, and to impose a tribute which has continued to the present time.

It appears that this expedition was the epocha of a considerable change in the constitution of the Druzes. Till then they had lived in a sort of anarchy, under the command of different shaiks or lords. The nation was likewise divided into two factions, such as is to be found in all the Arab tribes, and which are distinguished into the party Kassi and the party Yamani. To simplify the administration, Ibrahim permitted them only one chief who should be responsible for the tribute, and execute the office of civil magistrate; and this governor, from the nature of his situation, acquiring great authority, became almost the king of the republic; but as he was always chosen from among the Druzes, a consequence followed which the Turks had not foreseen, and which was nearly fatal to their power. For the chief thus chosen, having at his disposal the whole strength of the nation, was able to give it unanimity and energy, and it naturally turned against the Turks; since the Druzes, by becoming their subjects, had not ceased to be their enemies. They took care, however, that their attacks should be indirect, so as to save appearances, and only engaged in secret hostilities, more dangerous, perhaps, than open war.

About this time, that is, the beginning of the 17th century, the power of the Druzes attained its greatest height; which it owed to the talents and ambition of the celebrated Fakar-el-din, commonly called *Fakardin*. No sooner was this prince advanced to be the chief of that people than he turned his whole attention to humble the Ottoman power, and aggrandize himself at its expense. In this enterprize he displayed an address seldom seen among the Turks. He first gained the confidence of the Porte, by every demonstration of loyalty and fidelity; and as the Arabs at that time infected the plain of Balbek and the countries of Sour and Acre, he made war upon them, freed the inhabitants from their depredations, and thus rendered them desirous of living under his government.

The city of Bairout was situated advantageously for his designs, as it opened a communication with foreign countries, and, among others, with the Venetians, the natural enemies of the Turks. Fakar-el-din

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availed himself of the misconduct of the Aga, expelled him, seized on the city, and even had the art to make a merit of this act of hostility with the Divan, by paying a more considerable tribute. He proceeded in the same manner at Saïde Balbek and Sour; and at length, about the year 1613, saw himself master of all the country as far as Adjaloun and Safad. The pachas of Tripoli and Damascus could not see these encroachments with indifference; sometimes they opposed him with open force, though ineffectually, and sometimes endeavoured to ruin him at the Porte by secret insinuations; but the Emir, who maintained there his spies and defenders, defeated every attempt.

At length, however, the Divan began to be alarmed at the progress of the Druzes, and made preparations for an expedition capable of crushing them. Whether from policy or fear, Faker-el-din did not think proper to wait this storm. He had formed connections in Italy, on which he built great hopes, and determined to go in person to solicit the succours they had promised him; persuaded that his presence would encrease the zeal of his friends, while his absence might appease the resentment of his enemies. He therefore embarked at Bairout; and after resigning the administration to his son Ali, repaired to the court of the Medici at Florence. The arrival of an Oriental prince in Italy did not fail to attract the public attention. Enquiry was made into his nation, and the origin of the Druzes became popular topics of research. Their history and religion were found to be so little known as to leave it a matter of doubt whether they should be classed with the Mahometans or Christians. The Crusades were called to mind; and it was soon suggested, that a people who had taken refuge in the mountains, and were enemies to the natives, could be no other than the offspring of the Crusaders.

This idle conceit was too favourable to Faker-el-din for him to endeavour to disprove it: he was artful enough, on the contrary, to pretend he was related to the house of Lorraine; and the missionaries and merchants, who promised themselves a new opening for conversion and commerce, encouraged his pretensions. When an opinion is in vogue, every one discovers new proofs of its certainty. The learned in etymology, struck with the resemblance of the names, insisted, that Druzes and Dreux must be the same word; and on this foundation formed the system of a pretended colony of French Crusaders, who, under the conduct of a Comte de Dreux, had formed a settlement in Lebanon. This hypothesis, however, was completely overthrown by the remark, that the name of the Druzes is to be found in the itinerary of Benjamin of Tudela, who travelled before the time of the Crusades. Indeed the futility of it ought to have been sufficiently apparent at first, from the single consideration, that had they been descended from any nation of the Franks, they must have retained at least the traces of some European language; for a people, retired into a separate district, and living distinct from the natives of the country, do not lose their language. That of the Druzes, however, is very pure Arabic, without a single word of European origin. The real derivation of the name of this people has been long in our possession without our knowing it. It

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originates from the founder of the sect of Mohammed-ben-Ismael, who was surnamed *El-Dorzi*, and not *El-Darari*, as it is usually printed: the confusion of these two words, so different in our writing, arises from the figure of the two Arabic letters *r* and *z*, which have only this difference, that the *z* has a point over it, frequently omitted or effaced in the manuscripts.

After a stay of nine years in Italy, Faker-el-din returned to resume the government of his country. During his absence, his son Ali had repulsed the Turks, appeased discontents, and maintained affairs in tolerable good order. Nothing remained for the Emir, but to employ the knowledge he could not but have acquired, in perfecting the internal administration of government, and promoting the welfare of the nation; but instead of the useful and valuable arts, he wholly abandoned himself to the frivolous and expensive, for which he had imbibed a passion while in Italy. He built numerous villas; constructed baths, and planted gardens; he even presumed, without respect to the prejudices of his country, to employ the ornaments of painting and sculpture, notwithstanding these are prohibited by the Koran.

The consequences of this conduct soon manifested themselves: the Druzes, who paid the same tribute as in time of war, became dissatisfied. The Yamani faction were roused; the people murmured at the expenses of the prince; and the luxury he displayed renewed the jealousy of the pachas. They attempted to levy greater tribute: hostilities again commenced, and Faker-el-din repulsed the forces of the pachas; who took occasion, from this resistance, to render him suspected by the sultan himself. Amurath III. incensed that one of his subjects should dare to enter into a competition with him, resolved on his destruction; and the pacha of Damascus received orders to march, with all his forces, against Bairout, the usual residence of Faker-el-din; while 40 galleys invested it by sea, and cut off all communication.

The Emir, who depended on his good fortune and succours from Italy, determined at first to brave the storm. His son Ali, who commanded at Safad, was ordered to oppose the progress of the Turkish army; and in fact he bravely resisted them, notwithstanding the great disparity of his forces: but after two engagements, in which he had the advantage, being slain in a third attack, the face of affairs were greatly changed, and every thing went to ruin. Faker-el-din, terrified at the loss of his troops, afflicted at the death of his son, and enfeebled by age and a voluptuous life, lost both courage and presence of mind. He no longer saw any resource but in a peace, which he sent his second son to solicit of the Turkish admiral, whom he attempted to seduce by presents; but the admiral, detaining both the presents and envoy, declared he would have the prince himself. Faker-el-din, intimidated, took to flight, and was pursued by the Turks, now masters of the country. He took refuge on the steep eminence of Niha, where they besieged him ineffectually for a whole year, when they left him at liberty: but shortly after, the companions of his adversity, wearied with their sufferings, betrayed and delivered

Druzes. delivered him up to the Turks. Faker-el-din, though in the hands of his enemies, conceived hopes of pardon, and suffered himself to be carried to Constantinople; where Amurath, pleased to behold at his feet a prince so celebrated, at first treated him with that benevolence which arises from the pride of superiority; but soon returning to his former jealousies, yielded to the instigations of his courtiers, and, in one of his violent fits of passion, ordered him to be strangled, about the year 1631.

After the death of Faker-el-din, the posterity of that prince still continued in possession of the government, though at the pleasure, and as vassals, of the Turks. This family failing in the male line at the beginning of the present century, the authority devolved, by the election of the shaiks, on the house of Shelah, in which it still continues. The only emir of that house, whose name deserves to be preserved, is the emir Melhem, who reigned from 1740 to 1759; in which interval he retrieved the losses of the Druzes, and restored them to that consequence which they had lost by the defeat of Faker-el-din. Towards the end of his life, about the year 1754, Melhem, wearied with the cares of government, abdicated his authority, to live in religious retirement, after the manner of the Okkals; but the troubles that succeeded occasioned him once more to resume the reins of government, which he held till 1759, when he died, universally regretted.

He left three sons, minors: the eldest of whom ought, according to the custom of the country, to have succeeded him; but being only 11 years of age, the authority devolved on his uncle Mansour, agreeable to a law very general in Asia, which wills the people to be governed by a sovereign who has arrived at years of maturity. The young prince was but little fitted to maintain his pretensions; but a Maronite, named Sad-el-Kouri, to whom Melhem had entrusted his education, took this upon himself. Aspiring to see his pupil a powerful prince, that he might himself become a powerful viceroy, he made every exertion to advance his fortune. He first retired with him to Djebail, in the Kesraouan, where the emir Yousef possessed large domains, and there undertook to conciliate the Maronites, by embracing every opportunity to serve both individuals and the nation. The great revenues of his pupil, and the moderation of his expenditure, amply furnished him with the means. The farm of the Kesraouan was divided between several shaiks, with whom the Porte was not very well satisfied. Sad treated for the whole with the pacha of Tripoli, and got himself appointed sole receiver. The Motualis of the valley of Balbek had for some years before made several encroachments on Lebanon, and the Maronites began to be alarmed at the near approach of these intolerant Mahometans. Sad purchased of the pacha of Damascus a permission to make war upon them; and in 1763 drove them out of the country. The Druzes were at that time divided into two factions: Sad united his interest with those who opposed Mansour, and secretly prepared the plot which was to raise the nephew on the ruin of the uncle.

At this period the Arab Daher, who had made himself master of Galilee, and fixed his residence at

Acre, disquieted the Porte by his progress and pretensions: to oppose him, the Divan had just united the pachalics of Damascus, Saide, and Tripoli, in the hands of Osman and his children; and it was evident, that an open war was not very remote. Mansour, who dreaded the Turks too much to resist them, made use of the policy usual on such occasions, pretending a zeal for their service, while he secretly favoured their enemy. This was a sufficient motive for Sad to pursue measures directly opposite. He supported the Turks against the faction of Mansour, and manœuvred with so much good fortune or address as to depose that emir in 1770, and place Yousef in his government.

In the following year Ali Bey declared war and attacked Damascus. Yousef, called on by the Turks, took part in the quarrel, but without being able to draw the Druzes from their mountains to enter into the army of the Ottomans. Besides their natural repugnance, at all times, to make war out of their country, they were on this occasion too much divided at home to quit their habitations, and they had reason to congratulate themselves on the event. The battle of Damascus ensued; and the Turks, as we have already seen, were completely routed. The pacha of Saide escaping from this defeat, and not thinking himself in safety in that town, sought an asylum even in the house of the emir Yousef. The moment was unfavourable; but the face of affairs soon changed by the flight of Mohammad Bey. The emir, concluding that Ali Bey was dead, and not imagining that Daher was powerful enough singly to maintain the quarrel, declared openly against him. Saide was threatened with a siege, and he detached 1500 men of his faction to its defence; while himself in person, prevailing on the Druzes and Maronites to follow him, made an incursion with 25,000 peasants into the valley of Bekaa; and in the absence of the Motualis, who had joined the army of Daher, laid the whole country waste with fire and sword from Balbek to Tyre.

While the Druzes, proud of this exploit, were marching in disorder towards the latter city, 500 Motualis, informed of what had happened, flew from Acre inflamed with rage and despair, and fell with such impetuosity on their army as to give them a complete overthrow. Such was the surprise and confusion of the Druzes, that, imagining themselves attacked by Daher himself and betrayed by their companions, they turned their swords on each other as they fled. The steep declivities of Djekin, and the pine-woods which were in the route of the fugitives, were strewed with dead, but few of whom perished by the hands of the Motualis.

The emir Yousef, ashamed of this defeat, escaped to Dair-el Kamar, and shortly after attempted to take revenge; but being again defeated in the plain between Saide and Sour (Tyre), he was constrained to resign to his uncle Mansour the ring, which among the Druzes is the symbol of command. In 1773 he was restored by a new revolution; but he could not support his power but at the expense of a civil war. In order, therefore, to prevent Dairout falling into the hands of the adverse faction, he requested the assistance of the Turks, and demanded of the pacha of Damascus a man of sufficient abilities to defend that city. The choice

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choice fell on an adventurer ; who, from his subsequent fortune, merits to be made known.

This man, named Ahmad, is a native of Bosnia, and speaks the Slavonian as his mother tongue, as the Ragusan captains, with whom he converses in preference to those of every other nation, assert. It is said, that flying from his country at the age of 16, to escape the consequences of an attempt to violate his sister-in-law, he repaired to Constantinople, where, destitute of the means of procuring a subsistence, he sold himself to the slave-merchants to be conveyed to Egypt ; and, on his arrival at Cairo, was purchased by Ali Bey, who placed him among his Mamlouks.

Ahmad was not long in distinguishing himself by his courage and address. His patron employed him on several occasions in dangerous *coups de main*, such as the assassination of such beys and cashefs as he suspected ; of which commissions he acquitted himself so well as to acquire the name of *Djezzar*, which signifies *Cut-throat*. With this claim to his friendship, he enjoyed the favour of Ali until it was disturbed by an accident.

This jealous Bey having proscribed one of his benefactors called Saleh Bey, commanded Djezzar to cut off his head. Either from humanity or some secret friendship for the devoted victim, Djezzar hesitated, and even remonstrated against the order. But learning the next day that Mohammed Bey had executed the commission, and that Ali had spoken of him not very favourably, he thought himself a lost man, and, to avoid the fate of Saleh Bey, escaped unobserved, and reached Constantinople. He there solicited employments suitable to his former rank ; but meeting, as is usual in capitals, with a great number of rivals, he pursued another plan, and went to seek his fortune in Syria as a private soldier. Chance conducted him among the Druzes, where he was hospitably entertained, even in the house of the *kiaya* of the emir Yousef. From thence he repaired to Damascus, where he soon obtained the title of *Aga*, with a command of five pair of colours, that is to say, of 50 men ; and he was thus situated when fortune destined him to the government of Bairout.

Djezzar was no sooner established there than he took possession of it for the Turks. Yousef was confounded at this proceeding. He demanded justice at Damascus ; but finding his complaints treated with contempt, entered into a treaty with Daher, and concluded an offensive and defensive alliance with him at Ras-el-aen, near to Sour. No sooner was Daher united with the Druzes than he laid siege to Bairout by land, whilst two Russian frigates, whose service was purchased by 600 purses, cannonaded it by sea. Djezzar was compelled to submit to force, and, after a vigorous resistance, gave up the city and surrendered himself prisoner. Shaik Daher, charmed with his courage, and flattered with the preference he had given him in the surrender, conducted him to Acre, and showed him every mark of kindness. He even ventured to trust him with a small expedition into Palestine ; but Djezzar, on approaching Jerusalem, went over to the Turks and returned to Damascus.

The war of Mohammed Bey breaking out, Djezzar offered his service to the captain Pacha, and gained his confidence. He accompanied him to the siege of Acre ;

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and that admiral having destroyed Daher, and finding no person more proper than Djezzar to accomplish the designs of the Porte in that country, named him pacha of Saïde.

Being now, in consequence of this revolution, superior lord to the emir Yousef, Djezzar is mindful of injuries in proportion as he has reason to accuse himself of ingratitude. By a conduct truly Turkish, feigning alternately gratitude and resentment, he is alternately on terms of dispute and reconciliation with him, continually exacting money as the price of peace, or as indemnity for war. His artifices have succeeded so well, that within the space of five years he has extorted from the emir four millions of French money (above L. 160,000), a sum the more astonishing, as the farm of the country of the Druzes did not then amount to 100,000 livres (L. 4000).

In 1784 he made war on him, deposed him, and bestowed the government on the emir of the country of Halbey, named Imzel. Yousef, having once more purchased his favour, returned towards the end of the same year to Dair-el-Kamar, and even courted his confidence so far as to wait on him at Acre, from whence nobody expected him to return ; but Djezzar is too cunning to shed blood while there are any hopes of getting money : he released the prince, and sent him back with every mark of friendship. Since that period the Porte has named him pacha of Damascus, while he also retained the sovereignty of the pachalic of Acre, and of the country of the Druzes.

As to the religion of the Druzes : What has been already said of the opinions of Mohammed-ben-Ismael may be regarded as the substance of it. They practise neither circumcision, nor prayers, nor fasting ; they observe neither festivals nor prohibitions. They drink wine, eat pork, and allow marriage between brothers and sisters, though not between fathers and children. From this we may conclude, with reason, that the Druzes have no religion ; yet one class of them must be excepted, whose religious customs are very peculiar. Those who compose it are to the rest of the nation what the initiated were to the profane ; they assume the name of *Okkals*, which means spiritualists, and bestow on the vulgar the epithet of *Djabel* or ignorant ; they have various degrees of initiation, the highest orders of which require celibacy. These are distinguishable by the white turban they affect to wear, as a symbol of their purity ; and so proud are they of this supposed purity, that they think themselves sullied by even touching a profane person. If you eat out of their plate, or drink out of their cup, they break them ; and hence the custom, so general in this country, of using vases with a sort of cock, which may be drunk out of without touching them with the lips. All their practices are enveloped in mysteries : their oratories always stand alone, and are constantly situated on eminences : in these they hold their secret assemblies, to which women are admitted. It is pretended they perform ceremonies there in presence of a small statue resembling an ox or a calf ; whence some have pretended to prove that they are descended from the Samaritans. But besides that the fact is not well ascertained, the worship of the ox may be deduced from other sources.

They have one or two books which they conceal with

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with the greatest care : but chance has deceived their jealousy ; for in a civil war which happened 9 or 10 years ago, the emir Yousef, who is *Djabel* or ignorant, found one among the pillage of one of their oratories. M. Volney was assured, by persons who had read it, that it contains only a mystic jargon, the obscurity of which doublets renders it valuable to adepts. Hakem Bamr-ellah is there spoken of, by whom they mean God incarnated in the person of the caliph. It likewise treats of another life, of a place of punishment, and a place of happiness where the Okkals shall of course be most distinguished. Several degrees of perfection are mentioned, to which they arrive by successive trials. In other respects, these sectaries have all the infolence and all the fears of superstition : they are not communicative, because they are weak ; but it is probable that, were they powerful, they would be promulgators and intolerant.

The rest of the Druzes, strangers to this spirit, are wholly indifferent about religious matters. The Christians who live in their country pretend that several of them believe in the metempsychosis ; that others worship the sun, moon, and stars : all which is possible ; for, as among the Anafaria, every one, left to his own fancy, follows the opinion that pleases him most ; and these opinions are those which present themselves most naturally to unenlightened minds. When among the Turks, they affect the exterior of Mahometans, frequent the mosques, and perform their ablutions and prayers. Among the Maronites, they accompany them to church, and, like them, make use of holy water. Many of them, importuned by the missionaries, suffer themselves to be baptized ; and if solicited by the Turks, receive circumcision, and conclude by dying neither Christians nor Mahometans ; but they are not so indifferent in matters of civil policy.

The Druzes may be divided into two classes : the common people ; and the people of eminence and property, distinguished by the title of shaiks and emirs, or descendants of princes. The greater part are cultivators, either as farmers or proprietors ; every man lives on his inheritance, improving his mulberry-trees and vineyards : in some districts they grow tobacco, cotton, and some grain, but the quantity of these is inconsiderable. It appears that at first all the lands were, as formerly in Europe, in the hands of a small number of families. *But to render them productive, the great proprietors were forced to sell part of them, and let leases ; which subdivision is become the chief source of the power of the state, by multiplying the number of persons interested in the public weal : there still exists, however, some traces of the original inequality, which even at this day produces pernicious effects. The great property possessed by some families gives them too much influence in all the measures of the nation ; and their private interests have too great weight in every public transaction. Their history, for some years back, affords sufficient proofs of this ; since all the civil or foreign wars in which they have been engaged have originated in the ambition and personal views of some of the principal families, such as the Lefeks, the Djambelats, the Ismaels of Solyrna, &c. The shaiks of these houses, who alone possess one-tenth part of the country, procure creatures by their money, and at last involved all the Druzes in their dissensions. It

must be owned, however, that possibly to this conflict between contending parties the whole nation owes the good fortune of never having been enslaved by its chief.

This chief, called *Hakem* or governor, also *Emir* or prince, is a sort of king or general, who unites in his own person the civil and military powers. His dignity is sometimes transmitted from father to son, sometimes from one brother to another ; and the succession is determined rather by force than any certain laws. Females can in no case pretend to this inheritance. They are already excluded from succession in civil affairs, and consequently can still less expect it in political : in general, the Asiatic governments are too turbulent, and their administration renders military talents too necessary, to admit of the sovereignty of women. Among the Druzes, the male line of any family being extinguished, the government devolves to him who is in possession of the greatest number of suffrages and resources. But the first step is to obtain the approbation of the Turks, of whom he becomes the vassal and tributary. It even happens, that, not unfrequently to assert their supremacy, they name the Haken, contrary to the wishes of the nation, as in the case of Ismael Halbeya, raised to that dignity by Djezzar ; but this contrainst lasts no longer than it is maintained by that violence which gave it birth. The office of the governor is to watch over the good order of the state, and to prevent the Emirs, Shaiks, and villages, from making war on each other : in case of disobedience, he may employ force. He is also at the head of the civil power, and names the Cadis, only always reserving to himself the power of life and death. He collects the tribute, from which he annually pays to the pacha a stated sum. This tribute varies in proportion as the nation renders itself more or less formidable : at the beginning of this century, it amounted to 160 purses, L. 8330 ; but Melhem forced the Turks to reduce it to 60. In 1784, Emir Yousef paid 80 and promised 90. This tribute, which is called *Miri*, is imposed on the mulberry-trees, vineyards, cotton, and grain. All sown land pays in proportion to its extent ; every foot of mulberries is taxed at three medins, or three sols nine deniers (not quite two-pence). A hundred feet of vineyard pays a piastr or 40 medins ; and fresh measurements are often made to preserve a just proportion. The shaiks and emirs have no exemption in this respect ; and it may be truly said they contribute to the public stock in proportion to their fortune. The collection is made almost without expence. Each man pays his contingent at Dair-el-Kamer, if he pleases, or to the collectors of the prince, who make a circuit round the country after the crop of silks. The surplus of this tribute is for the prince ; so that it is his interest to reduce the demands of the Turks, as it would be likewise to augment the impost : but this measure requires the sanction of the shaiks, who have the privilege of opposing it. Their consent is necessary, likewise, for peace and war. In these cases, the emir must convoke general assemblies, and lay before them the state of his affairs. There every shaik, and every peasant who has any reputation for courage or understanding, is intitled to give his suffrage ; so that this government may be considered as a well-proportioned mixture of monarchy, aristocracy, and democracy. Every thing depends on circumstan-

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ces : if the governor be a man of ability, he is absolute; if weak, a cypher. This proceeds from the want of fixed laws ; a want common to all Asia, and the radical cause of all the disorders in the governments of the Asiatic nations.

Neither the chief nor the individual emirs maintain troops; they have only persons attached to the wand service of their houses, and a few black slaves. When the nation makes war, every man, whether shaik or peasant, able to bear arms, is called upon to march. He takes with him a little bag of flour, a musket, some bullets, a small quantity of powder, made in his village, and repairs to the rendezvous appointed by the governor. If it be a civil war, as sometimes happens, the servants, the farmers, and their friends, take up arms for their patron, or the chief of their family, and repair to his standard. In such cases, the parties irritated frequently seem on the point of proceeding to the last extremities ; but they seldom have recourse to acts of violence, or attempt the death of each other ; mediators always interpose, and the quarrel is appeased the more readily as each patron is obliged to provide his followers with provisions and ammunition. This system, which produces happy effects in civil troubles, is attended with great inconvenience in foreign wars, as sufficiently appeared in that of 1784. Djazzar, who knew that the whole army lived at the expence of the emir Yousef, aimed at nothing but delay, and the Druses, who were not displeased at being fed for doing nothing, prolonged the operations ; but the emir, wearied of paying, concluded a treaty, the terms of which were not a little rigorous for him, and eventually for the whole nation, since nothing is more certain than that the interests of a prince and his subjects are always inseparable.

“ The ceremonies to which I have been a witness on these occasions (says M. Volney), bear a striking resemblance to the customs of ancient times. When the emir and the shaiks had determined on war at Daer-el-Kamar, cryers in the evening ascended the summits of the mountain ; and there began to cry with a loud voice : ‘ To war, to war ; take your guns, take your pistols : noble shaiks, mount your horses ; arm yourselves with the lance and sabre ; rendezvous to-morrow at Dair-el-Kamar. Zeal of God ! zeal of combats ! ’ This summons, heard from the neighbouring villages, was repeated there ; and as the whole country is nothing but a chain of lofty mountains and deep valleys, the proclamation passed in a few hours to the frontiers. These voices, from the stillness of the night, the long resounding echoes, and the nature of the subject, had something awful and terrible in their effect. Three days after 15000 armed men rendezvoused at Dair-el-Kamar, and operations might have been immediately commenced.

“ We may easily imagine that troops of this kind no way resemble our European soldiers ; they have neither uniforms, nor discipline, nor order. They are a crowd of peasants with short coats, naked legs, and muskets in their hands ; differing from the Turks and Mamlouks in that they are all foot ; the shaiks and emirs alone having horses, which are of little use from the rugged nature of the country. War there can only be a war of posts. The Druses never risk themselves in the plain ; and with reason : for they would be unable to stand the shock of cavalry, having no bayonets to their muskets. Their whole art consists in climbing rocks, creeping among the bushes and blocks

Druses.

of stone ; from whence their fire is the more dangerous, as they are covered, fire at their ease, and by hunting and military sports have acquired the habit of hitting a mark with great dexterity. They are accustomed to sudden inroads, attacks by night, ambuscades, and all those *coups de main* which require to fall suddenly on, and come to close fight with the enemy. Ardent in improving their success, easily dispirited, and prompt to return their courage ; daring even to temerity, and sometimes ferocious, they possess above all two qualities essential to the excellency of any troops ; they strictly obey their leaders, and are endowed with a temperance and vigour of health at this day unknown to most civilized nations. In the campaign of 1784, they passed three months in the open air without tents, or any other covering than a sheep-skin ; yet were there not more deaths or maladies than if they had remained in their houses. Their provisions consisted, as at other times, of small loaves baked on the ashes or on a brick, raw onions, cheese, olives, fruits, and a little wine. The table of the chiefs was almost as frugal ; and we may affirm, that they subsisted 100 days, on what the same number of Englishmen or Frenchmen would not have lived ten. They have no knowledge of the science of fortification, the management of artillery or encampments, nor, in a word, any thing which constitutes the art of war. But had they among them a few persons versed in military science, they would readily acquire its principles, and become a formidable soldiery. This would be the more easily effected, as their mulberry plantations and vineyards do not occupy them all the year, and they could afford much time for military exercises.”

By the last estimates, according to M. Volney's information, the number of men able to bear arms was 40,000, which supposes a total population of 120,000 : no addition is to be made to this calculation, since there are no Druses in the cities or on the coast. As the whole country contains only 110 square leagues, there results for every league 1000 persons ; which is equal to the population of our richest provinces. To render this more remarkable, it must be observed that the soil is not fertile, that a great many crinchees remain uncultivated, that they do not grow corn enough to support themselves three months in the year, that they have no manufactures, and that all their exportations are confined to silks and cottons, the balance of which exceeds very little the importation of corn from the Hauran, the oils of Palestine, and the rice and coffee they procure from Bairout. Whence arises then such a number of inhabitants within so small a space ? “ I can discover no other cause (says our author), than that ray of liberty which glimmers in this country. Unlike the Turks, every man lives in a perfect security of his life and property. The peasant is not richer than in other countries ; but he is free. ‘ He fears not,’ as I have often heard them say, ‘ that the Aga, the Kaimmakam, or the Pacha, should send their Djendis to pillage his house, carry off his family, or give him the ballinado.’ Such oppressions are unknown among these mountains. Security, therefore, has been the original cause of population, from that inherent desire which all men have to multiply themselves wherever they find an easy subsistence. The frugality of the nation which is content with little, has been a secondary, and not a less powerful reason ; and a third is the emigration

emigration of a number of Christian families, who daily desert the Turkish provinces to settle in Mount Lebanon, where they are received with open arms by the Maronites from similarity of religion, and by the Druzes from principles of toleration, and a conviction how much it is the interest of every country to multiply the number of its cultivators, consumers, and allies.

“The comparison which the Druzes often have an opportunity of making between their situation and that of other subjects of the Turkish government, has given them an advantageous opinion of their superiority, which, by a natural effect, has an influence on their personal character. Exempt from the violence and insults of despotism, they consider themselves as more perfect than their neighbours, because they have the good fortune not to be equally debased. Hence they acquire a character more elevated, energetic, and active; in short, a genuine republican spirit. They are considered throughout the Levant as restless, enterprising, hardy, and brave even to temerity. Only 300 of them have been seen to enter Damascus in open day, and spread around them terror and carnage. No people are more nice than they with respect to the point of honour: any offence of that kind, or open insult, is instantly punished by blows of the kandjur or the musket; while among the inhabitants of the towns, it only excites injurious retorts. This delicacy has occasioned in their manners and discourse a reserve, or, if you will, a politeness, which one is astonished to discover among peasants. It is carried even to dissimulation and falsehood, especially among the chiefs, whose greater interests demand greater attentions. Circumspection is necessary to all, from the formidable consequences of that retaliation of which I have spoken. These customs may appear barbarous to us; but they have the merit of supplying the deficiency of regular justice, which is necessarily tedious and uncertain in these disorderly and almost anarchical governments.

“The Druzes have another point of honour, that of hospitality. Whoever presents himself at their door in the quality of a suppliant or passenger, is sure of being entertained with lodging and food in the most generous and unaffected manner. M. Volney often saw the lowest peasants give the last morsel of bread they had in their houses to the hungry traveller; and when it was observed to them that they wanted prudence, their answer was, ‘God is liberal and great, and all men are brethren.’ There are, therefore, no inns in their country any more than in the rest of Turkey. When they have once contracted with their guest the sacred engagement of bread and salt, no subsequent event can make them violate it. Various instances of this are related, which do honour to their character. A few years ago, an aga of the janissaries having been engaged in a rebellion, fled from Damascus and retired among the Druzes. The pacha was informed of this, and demanded him of the emir, threatening to make war on him in case of refusal. The emir demanded him of the shaik Talhouk, who had received him; but the indignant shaik replied, ‘When you have known the Druzes deliver up their guests? Tell the emir, that as long as Talhouk shall preserve his beard, not a hair of the head of his suppliant shall fall!’ The emir threatened him with force; Talhouk armed his

family. The emir, dreading a revolt, adopted a method practised as juridical in that country. He declared to the shaik, that he would cut down 50 mulberry-trees a-day until he should give up the aga. He proceeded as far as a thousand, and Talhouk still remained inflexible. At length the other shaiks, enraged, took up the quarrel; and the commotion was about to become general, when the aga, reproaching himself with being the cause of so much mischief, made his escape without the knowledge even of Talhouk.

“The Druzes have also the prejudices of the Bedouins respecting birth; like them, they pay great respect to the antiquity of families; but this produces no essential inconveniences. The nobility of the emirs and shaiks does not exempt them from paying tribute in proportion to their revenues. It confers on them no prerogatives, either in the attainment of landed property or public employments. In this country, no more than in all Turkey, are they acquainted with game-laws, or glebes, or feigniorial or ecclesiastical tithes, franc fiefs or alienation fines; every thing is held in freehold: Every man, after paying his miri and his rent, is master of his property. In short, by a particular privilege, the Druzes pay no fine for their succession; nor does the emir, like the sultan, arrogate to himself original and universal property: there exists, nevertheless, in the law of inheritance, an imperfection which produces disagreeable effects. Fathers have, as in the Roman law, the power of preferring such of their children as they think proper: hence it has happened in several families of the shaiks, that the whole property has centered in the same person, who has perverted it to the purpose of intriguing and caballing, while his relations remain, as they well express it, *princes of olives and cheese*; that is to say, poor as peasants.

“In consequence of their prejudices, the Druzes do not choose to make alliances out of their own families. They invariably prefer their relation, though poor, to a rich stranger; and poor peasants have been known to refuse their daughters to merchants of Saïde and Bairout, who possessed from twelve to fifteen thousand piastres. They observe also, to a certain degree, the custom of the Hebrews, which directed that a brother should espouse his brother’s widow; but this is not peculiar to them, for they retain that as well as several other customs of that ancient people, in common with other inhabitants of Syria and all the Arab tribes.

“In short, the proper and distinctive character of the Druzes is a sort of republican spirit, which gives them more energy than any other subjects of the Turkish government, and an indifference for religion, which forms a striking contrast with the zeal of the Mahometans and Christians. In other respects, their private life, their customs and prejudices, are the same with other orientals. They may marry several wives, and repudiate them when they choose; but, except by the emir and a few men of eminence, that is rarely practised. Occupied with their rural labours, they experience neither artificial wants, nor those inordinate passions which are produced by the idleness of the inhabitants of cities and towns. The veil, worn by their women, is of itself a preservative against those desires which are the occasion of so many evils in society.

Druzes,
Drusius.

ciety. No man knows the face of any other woman than his wife, his mother, his sister, and sisters-in-law. Every man lives in the bosom of his own family, and goes little abroad. The women, tho' even of the shaiks, make the bread, roast the coffee, wash the linen, cook the victuals, and perform all domestic offices. The men cultivate their lands and vineyards, and dig canals for watering them. In the evening they sometimes assemble in the court, the area, or house of the chief of the village or family. There, seated in a circle, with legs crossed, pipes in their mouths, and poniards at their belts, they discourse of their various labours, the scarcity or plenty of their harvests, peace or war, the conduct of the emir, or the amount of the taxes; they relate past transactions, discuss present interests, and form conjectures on the future. Their children, tired with play, come frequently to listen; and a stranger is surprised to hear them, at ten or twelve years old, recounting, with a serious air, why Djeddar declared war against the emir Yousef, how many purges it cost that prince, what augmentation there will be of the miri, how many muskets there were in the camp, and who had the best mare. This is their only education. They are neither taught to read the psalms as among the Maronites, nor the koran like the Mahometans; hardly do the shaiks know how to write a letter. But if their mind be destitute of useful or agreeable information, at least it is not preoccupied by false and hurtful ideas; and, without doubt, such natural ignorance is well worth all our artificial folly. This advantage results from it, that their understandings being nearly on a level, the inequality of conditions is less perceptible. For, in fact, we do not perceive among the Druzes that great distance which, in most other societies, degrades the inferior, without contributing to the advantage of the great. All, whether shaiks or peasants, treat each other with that rational familiarity, which is equally remote from rudeness and servility. The grand emir himself is not a different man from the rest: he is a good country gentleman, who does not disdain admitting to his table the meanest farmer. In a word, their manners are those of ancient times, and of that rustic life which marks the origin of every nation; and prove that the people among whom they are still found are as yet only in the infancy of the social state."

DRUSIUS (John), a Protestant writer of great learning, born at Oudenarde in Flanders in 1555. He was designed for the study of divinity; but his father being outlawed, and deprived of his estate, they both retired to England, where the son became professor of the oriental languages at Oxford: but upon the pacification of Ghent, they returned to their own country, where Drusus was also appointed professor of the oriental languages. From thence he removed to Friesland, where he was admitted Hebrew professor in the university of Franeker; the functions of which he discharged with great honour till his death in 1616. His works show him to have been well skilled in Hebrew; and the States General employed him in 1600 to write notes on the most difficult passages in the Old Testament, with a pension of 400 florins a-year: but being frequently disturbed in this undertaking, it was not published till after his death. He held a vast correspondence with the learned; for besides letters in He-

brew, Greek, and other languages, there were found 2300 Latin letters among his papers. He had a son John, who died in England at 21, and was a prodigy for his early acquisition of learning; he wrote Notes on the Proverbs of Solomon, with many letters and verses in Hebrew.

DRYADS, in the heathen theology, a sort of deities, or nymphs, which the ancients thought inhabited groves and woods. They differed from the Hamadryades; these latter being attached to some particular tree, with which they were born, and with which they died; whereas the Dryades were goddesses of trees and woods in general. See HAMADRYADES.

DRYAS, in botany: A genus of the polygynia order, belonging to the icosaudria class of plants; and in the natural method ranking under the 35th order, *Scitocosa*. The calyx is octofid; the petals eight; the seeds long and hairy with a train.

DRYDEN (John), one of the most eminent English poets of the 17th century, descended of a genteel family in Huntingdonshire, was born in that county at Oldwinckle 1631, and educated at Westminster school under Dr Busby. From thence he was removed to Cambridge in 1650, being elected scholar of Trinity college, of which he appears, by his *Epithalamia Cantabrigiæ*, 4to, 1662, to have been afterwards a fellow. Yet in his earlier days he gave no extraordinary indication of genius; for even the year before he quitted the university, he wrote a poem on the death of Lord Hastings, which was by no means a preface of that amazing perfection in poetical powers which he afterwards possessed.

On the death of Oliver Cromwell he wrote some heroic stanzas to his memory; but on the Restoration, being desirous of ingratiating himself with the new court, he wrote first a poem intitled *Alfred Redux*, and afterwards a panegyric to the king on his coronation. In 1662, he addressed a poem to the lord chancellor Hyde, presented on New Year's day; and in the same year a satire on the Dutch. In 1668 appeared his *Annus Mirabilis*, which was an historical poem in celebration of the duke of York's victory over the Dutch. These pieces at length obtained him the favour of the crown; and Sir William Davenant dying the same year, Mr Dryden was appointed to succeed him as poet laureat. About this time also his inclination to write for the stage seems first to have shown itself. For besides his concern with Sir William Davenant in the alteration of Shakespeare's Tempest, in 1669 he produced his *Wild Gallants*, a comedy. This met with very indifferent success; yet the author, not being discouraged by its failure, soon published his *Indian Emperor*. This finding a more favourable reception, encouraged him to proceed; and that with such rapidity, that in the key to the Duke of Buckingham's Rehearsal he is recorded to have engaged himself by contract for the writing of four plays per year; and, indeed, in the years 1679 and 1680 he appears to have fulfilled that contract. To this unhappy necessity that our author lay under, are to be attributed all those irregularities, those bombastic flights, and sometimes even puerile exuberances, for which he has been so severely criticised; and which, in the unavoidable hurry in which he wrote, it was impossible he should find time either for lopping away or correcting.

Dryads
Dryden.

In 1675, the Earl of Rochester, whose envious and malevolent disposition would not permit him to see growing merit meet with its due reward, and was therefore sincerely chagrined at the very just applause with which Mr Dryden's dramatic pieces had been received, was determined if possible to shake his interest at court; and succeeded so far as to recommend Mr Crowne, an author by no means of equal merit, and at that time of an obscure reputation, to write a mask for the court, which certainly belonged to Mr Dryden's office as poet laureat.—Nor was this the only attack, nor indeed the most potent one, that Mr Dryden's justly acquired fame drew on him. For, some years before, the Duke of Buckingham, a man of not much better character than Lord Rochester, had most severely ridiculed several of our author's plays in his admired piece called the *Rehearsal*. But though the intrinsic wit which runs through that performance cannot even to this hour fail of exciting our laughter, yet at the same time it ought not to be the standard on which we should fix Mr Dryden's poetical reputation, if we consider, that the pieces there ridiculed are not any of those looked on as the *chef d'œuvre* of this author; that the very passages burlesqued are frequently, in their original places, much less ridiculous than when thus detached, like a rotten limb, from the body of the work; and exposed to view with additional distortions, and divested of that connection with the other parts, which, while preserved, gave it not only symmetry but beauty; and lastly, that the various inimitable beauties, which the critic has sunk in oblivion, are infinitely more numerous than the deformities which he has thus indelicately brought forth to our more immediate inspection.

Mr Dryden, however, did not suffer these attacks to pass with impunity; for in 1679 there came out an Essay on Satire, said to be written jointly by that gentleman and the Earl of Mulgrave, containing some very severe reflections on the Earl of Rochester and the Duchess of Portsmouth, who, it is not improbable, might be a joint instrument in the above-mentioned affront shown to Mr Dryden; and in 1681 he published his *Abdalom and Achitophel*, in which the well-known character of Zimri, drawn for the Duke of Buckingham, is certainly severe enough to repay all the ridicule thrown on him by that nobleman in the character of Bays.—The resentment shown by the different peers was very different. Lord Rochester, who was a coward as well as a man of the most depraved morals, basely hired three ruffians to cudgel Dryden in a coffeehouse: but the Duke of Buckingham, as we are told, in a more open manner, took the task upon himself: and at the same time presented him with a purse containing no very trifling sum of money; telling him, that he gave him the beating as a punishment for his impudence, but bestowed that gold on him as a reward for his wit.

In 1680 was published a translation of Ovid's *Epistles* in English verse by several hands, two of which, together with the preface, were by Mr Dryden; and in 1682 came out his *Religio Laici*, designed as a defence of revealed religion, against Deists, Papists, &c. Soon after the accession of King James II. our author changed his religion for that of the church of Rome, and wrote two pieces in vindication of the Romish tenets; *viz.* A Defence of the Papers written by the late King,

found in his strong box; and the celebrated poem, afterwards answered by Lord Halifax, intitled *The Hind and the Panther*.—By this extraordinary step he not only engaged himself in controversy, and incurred much censure and ridicule from his cotemporary wits; but on the completion of the Revolution, being, on account of his newly-chosen religion, disqualified from bearing any office under the government, he was stripped of the laurel, which, to his still greater mortification, was bestowed on Richard Flecknoe, a man to whom he had a most settled aversion. This circumstance occasioned his writing the very severe poem called *Mac Flecknoe*.

Mr Dryden's circumstances had never been affluent; but now being deprived of this little support, he found himself reduced to the necessity of writing for mere bread. We consequently find him from this period engaged in works of labour as well as genius, *viz.* in translating the works of others; and to this necessity perhaps our nation stands indebted for some of the best translations extant. In the year he lost the laurel, he published the life of St Francis Xavier from the French. In 1693 came out a translation of Juvenal and Persius; in the first of which he had a considerable hand, and of the latter the entire execution. In 1695 was published his prose version of Fresnoy's *Art of Painting*; and the year 1697 gave the world that translation of Virgil's works entire, which still does, and perhaps ever will, stand foremost among the attempts made on that author. The petite pieces of this eminent writer, such as prologues, epilogues, epitaphs, songs, &c. are too numerous to specify here, and too much dispersed to direct the reader to. The greatest part of them, however, are to be found in a collection of miscellanies in 6 vols 12mo. His last work is what is called his *Fables*, which consists of many of the most interesting stories in Homer, Ovid, Boccaccio, and Chaucer, translated or modernized in the most elegant and poetical manner; together with some original pieces, among which is that amazing ode on St Cecilia's day, which, though written in the very decline of the author's life, and at a period when old age and distress conspired as it were to damp his poetic ardor and clip the wings of fancy, yet possess so much of both, as would be sufficient to have rendered him immortal had he never written a single line besides.

Dryden married the lady Elizabeth Howard, sister to the Earl of Berkshire, who survived him eight years; though for the last four of them she was a lunatic, having been deprived of her senses by a nervous fever.—By this lady he had three sons; Charles, John, and Henry. Of the eldest of these there is a circumstance related by Charles Wilson, Esq; in his *Life of Congreve*, which seems so well attested, and is itself of so very extraordinary a nature, that we cannot avoid giving it a place here.—Dryden, with all his understanding, was weak enough to be fond of judicial astrology, and used to calculate the nativity of his children. When his lady was in labour with his son Charles, he being told it was decent to withdraw, laid his watch on the table, begging one of the ladies then present, in a most solemn manner, to take exact notice of the very minute that the child was born; which she did, and acquainted him with it. About a week after, when his lady was pretty well recovered, Mr Dryden took

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occasion to tell her that he had been calculating the child's nativity ; and observed, with grief, that he was born in an evil hour : for Jupiter, Venus, and the Sun, were all under the earth, and the lord of his ascendant afflicted with a hateful square of Mars and Saturn. " If he lives to arrive at the 8th year," says he, " he will go near to die a violent death on his very birth-day ; but if he should escape, as I see but small hopes, he will in the 23d year be under the very same evil direction ; and if he should escape that also, the 33d or 34th year is, I fear, —" Here he was interrupted by the immoderate grief of his lady, who could no longer hear calamity prophesied to befall her son. The time at last came, and August was the inauspicious month in which young Dryden was to enter into the eighth year of his age. The court being in progress, and Mr Dryden at leisure, he was invited to the country-seat of the Earl of Berkshire his brother-in-law, to keep the long vacation with him in Charleton in Wilts ; his lady was invited to her uncle Mordaunt's to pass the remainder of the summer. When they came to divide the children, lady Elizabeth would have him take John, and suffer her to take Charles : but Mr Dryden was too absolute, and they parted in anger ; he took Charles with him, and she was obliged to be content with John. When the fatal day came, the anxiety of the lady's spirits occasioned such an effluence of blood, as threw her into so violent a fever, that her life was despaired of, till a letter came from Mr Dryden, reproving her for her womanish credulity, and assuring her that her child was well ; which recovered her spirits, and in six weeks after the received an eclatification of the whole affair. Mr Dryden, either through fear of being reckoned superstitious, or thinking it a science beneath his study, was extremely cautious of letting any one know that he was a dealer in astrology ; therefore could not excuse his absence, on his son's anniversary, from a general hunting-match which Lord Berkshire had made, to which all the adjacent gentlemen were invited. When he went out, he took care to set the boy a double exercise in the Latin tongue, which he taught his children himself, with a strict charge not to stir out of the room till his return ; well knowing the task he had set him would take up longer time. Charles was performing his duty in obedience to his father ; but, as ill fate would have it, the stag made towards the house ; and the noise alarming the servants, they hastened out to see the sport. One of them took young Dryden by the hand, and led him out to see it also ; when, just as they came to the gate, the stag being at bay with the dogs, made a bold push, and leaped over the court-wall, which was very low and very old ; and the dogs following, threw down a part of the wall 10 yards in length, under which Charles Dryden lay buried. He was immediately dug out ; and after six weeks languishing in a dangerous way, he recovered. So far Dryden's prediction was fulfilled. In the 23d year of his age, Charles fell from the top of an old tower belonging to the Vatican at Rome, occasioned by a swimming in his head with which he was seized, the heat of the day being excessive. He again recovered, but was ever after in a languishing sickly state. In the 33d year of his age, being returned to England, he was unhappily drowned at Windsor. He had with another gentleman swam twice over the Thames ; but returning a

Dryden.

third time, it was supposed he was taken with the cramp, because he called out for help, though too late. Thus the father's calculation proved but too prophetic.

At last, after a long life, harassed with the most laborious of all fatigues, *viz.* that of the mind, and continually made anxious by distress and difficulty, our author departed this life on the first of May 1701. — The day after Mr Dryden's death, the dean of Westminster sent word to Mr Dryden's widow, that he would make a present of the ground and all other abbey-fees for the funeral : the Lord Halifax likewise sent to the lady Elizabeth, and to Mr Charles Dryden, offering to defray the expences of our poet's funeral, and afterwards to bestow 500*l.* on a monument in the abbey ; which generous offer was accepted. Accordingly, on Sunday following, the company being assembled, the corpse was put into a velvet hearse, attended by 18 mourning coaches. When they were just ready to move, Lord Jefferys, son of Lord Chancellor Jefferys, a name dedicated to infamy, with some of his rakish companions, riding by, asked whose funeral it was ; and being told it was Mr Dryden's, he protested he should not be buried in that private manner ; that he would himself, with the lady Elizabeth's leave, have the honour of the interment, and would bestow 1000*l.* on a monument in the abbey for him. This put a stop to their procession ; and the Lord Jefferys, with several of the gentlemen who had alighted from their coaches, went up stairs to the lady, who was sick in bed. His lordship repeated the purport of what he had said below ; but the lady Elizabeth refusing her consent, he fell on his knees, vowing never to rise till his request was granted. The lady under a sudden surprise fainted away ; and Lord Jefferys, pretending to have obtained her consent, ordered the body to be carried to Mr Ruffell's an undertaker in Cheapside, and to be left there till further orders. In the mean time the abbey was lighted up, the ground opened, the choir attending, and the bishop waiting some hours to no purpose for the corpse. The next day Mr Charles Dryden waited on the Lord Halifax and the bishop ; and endeavoured to excuse his mother, by relating the truth. Three days after, the undertaker, having received no orders, waited on the Lord Jefferys ; who pretended that it was a drunken frolic, that he remembered nothing of the matter, and he might do what he pleased with the body. Upon this the undertaker waited upon the lady Elizabeth, who desired a day's respite, which was granted. Mr Charles Dryden immediately wrote to the Lord Jefferys, who returned for answer, that he knew nothing of the matter, and would be troubled no more about it. Mr Dryden hereupon applied again to Lord Halifax and the Bishop of Rochester, who absolutely refused to do any thing in the affair.

In this distress, Dr Garth, who had been Mr Dryden's intimate friend, sent for the corpse to the college of physicians, and proposed a subscription ; which succeeding, about three weeks after Mr Dryden's decease, Dr Garth pronounced a fine Latin oration over the body, which was conveyed from the college, attended by a numerous train of coaches to Westminster-abbey, but in very great disorder. At last the corpse arrived at the abbey, which was all unlighted. No organ play-

ed,

Dryden.

ed, no anthem sung; only two of the singing boys preceding the corpse, who sang an ode of Horace, with each a small candle in their hand. When the funeral was over, Mr Charles Dryden sent a challenge to Lord Jefferys; who refusing to answer it, he sent several others, and went often himself; but could neither get a letter delivered, nor admittance to speak to him: which so incensed him, that finding his Lordship refused to answer him like a gentleman, he resolved to watch an opportunity, and brave him to fight, though with all the rules of honour; which his Lordship hearing, quitted the town, and Mr Charles never had an opportunity to meet him, though he sought it to his death with the utmost application.

Mr Dryden had no monument erected to him for several years; to which Mr Pope alludes in his epitaph intended for Mr Rowe, in this line,

Be each a rule and nameless stone he lies.

In a note upon which we are informed that the tomb of Mr Dryden was erected upon this hint by Sheffield duke of Buckingham, to which was originally intended this epitaph:

This Sheffield raised.—The sacred dust below
Was Dryden once; the rest, who does not know?

Which was since changed into the plain inscription now upon it, viz,

J. DRYDEN,

Natus Aug. 9. 1631.

Mortuus Mart. 1. 1701.

Joannes Sheffield, dux Buckinghamiensis fecit.

Mr Dryden's character has been very differently drawn by different hands, some of which have exalted it to the highest degree of commendation, and others debased it by the severest censure.—The latter, however, we must charge to that strong spirit of party which prevailed during great part of Dryden's time, and ought therefore to be taken with great allowances. Were we indeed to form a judgment of the author from some of his dramatic writings, we should perhaps be apt to conclude him a man of the most licentious morals; many of his comedies containing a great share of looseness, even extending to obscenity: But if we consider, that, as the poet tells us,

Those who live to please, must please to live;

if we then look back to the scandalous licence of the age he lived in, the indigence which at times he underwent, and the necessity he consequently lay under of complying with the public taste however depraved; we shall surely not refuse our pardon to the compelled writer, nor our credit to those of his contemporaries who were intimately acquainted with him, and who have assured us there was nothing remarkably vicious in his personal character.

From some parts of his history he appears unsteady, and to have too readily temporized with the several revolutions in church and state. This however might in some measure have been owing to that natural timidity and diffidence in his disposition, which almost all the writers seem to agree in his possessing. Congreve, whose authority cannot be suspected, has given us such an account of him, as makes him appear no less amiable in his private character as a man, than he was illustrious in his public one as a poet. In the former light, according to that gentleman, he was humane, compassionate, forgiving, and sincerely friendly: of an

extensive reading, a tenacious memory, and a ready communication: gentle in the correction of the writings of others, and patient under the reprehension of his own deficiencies: easy of access himself, but slow and diffident in his advances to others; and of all men the most modest and the most easy to be discontented in his approaches either to his superiors or his equals. As to his writings, he is perhaps the happiest in the harmony of his numbers, of any poet who ever lived either before or since his time, not even Mr Pope himself excepted. His imagination is ever warm, his images noble, his descriptions beautiful, and his sentiments just and becoming. In his prose he is poetical without bombast, concise without pedantry, and clear without prolixity. His dramatic have, perhaps, the least merit of all his writings. Yet there are many of them which are truly excellent; though he himself tells us that he never wrote any thing in that way to please himself but his *All for Love*. This last, indeed, and his *Spanish Friar*, may be reckoned two of the best plays our language has been honoured with.

DRYPIS, in botany: A genus of the trigynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 22d order, *Caryophylli*. The calyx is quinque-dentate; the petals five; the opening at the capsule as if cut round horizontally, monopermous.

DUBLIN, the metropolis of Ireland, the second city in his majesty's dominions, and esteemed the fifth for magnitude in Europe, is situated in the province of Leinster, in the county of Dublin, at the bottom of a large bay. The river Liffey, which here disembogues itself into the ocean, divides the town into nearly two equal parts. Formerly the city of Dublin was confined to the south side of the river: it was a place of great antiquity. Ptolemy, who flourished in the reign of Antoninus Pius, about the year 140, says, it was anciently called *Ascheled*. In 155, Alpinus, whose daughter Auliana was drowned in the Liffey, changed the name from *Ascheled* to *Auliana*. It was afterwards named *Dublana*, and Ptolemy calls it *Eblana*. *Dublana*, whence comes *Dublinum* and *Dublin*, is evidently derived from *Dub-leana*, "the place of the black harbour or lake," or rather "the lake of the sea," the bay of Dublin being frequently so called. This city has had a variety of names. The Irish call it *Drom-coll-cabill*, "the brow of a hazle wood;" and in 181, Eogan king Munster being on a royal tour, paid a visit to this place, which was then called *Atla Clath-Dubb-Line*, "the passage of the ford of hurdles over the black pool:" the harbour of Dublin was likewise known by the name of *Lean-Clath*, or *Lean-Clath*, from *Lean* or *Leam*, "a harbour;" and from *Clath* or *Clabb*, which literally signifies "a hurdle or any thing made of wicker-work;" it also signified certain wires formed with hurdles, and placed in rivers and bays by the ancient Irish for the purpose of taking fish: whence any river or bay where in these wires were fixed had the name of *Clath* or *Clabb* annexed to it, to signify the establishment of a fishery. Dublin, therefore, being originally built on or near one of these harbours, was anciently called *Baly-lean-Clath*, that is, the town on the fishing harbour. It is described at the present day in the Irish language by the appellations of *Ab-Clath*, "the ford of hurdles," and *Bally-ath-Clath*, "the town of the

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ford of hurdles," the inhabitants having formerly had access to the river by hurdles laid on the low marshy grounds adjoining the water: and this name was also extended to the north side of the river, from a temporary bridge of hurdles thrown over the Anna Liffey, a corruption of *Avin Louiffa*, or "the swift river," so termed from the rapidity of the mountain floods. This side was enlarged by Mac Turkill the Danish prince, who, notwithstanding, fixed his habitation on the south side, and abandoned the northern town; which, from the original country of the invaders, was called *Egismantowon*, since corrupted to *Osmantowon*. King Edgar, in the preface to his charter dated 964, mentions Ireland with its most noble city (*mobilissima civitas*) of Dublin. By the Fingallians it is called *Duvelin*, and by the Welch *Dinas-Dulin*, or the city of *Duvin*.

In 448, Alpin Mac Eachard, king of Dublin and all his subjects, were converted to Christianity by St Patrick.

In the year 498, the Othmen or Danes having entered the Liffey with a fleet of 60 sail, made themselves masters of Dublin and the adjacent country, and soon after environed the city with walls. About 1170 Dermot Mac Murrough, king of Leinster, having quarrelled with the other princes of the kingdom, a confederacy was formed against him by Roderick O'Connor, monarch of Ireland. Dermot applied to Henry II. king of England, who sent over a number of English adventurers, by whose assistance he was re-instituted in his dominions; and in the year 1171, the descendants of the Danes still continuing to hold possession of Dublin, it was besieged and taken by a powerful party of the English under Raymond le Gros. Mac Turkill the Danish king escaped to his shipping; he returned, however, soon after with a strong fleet to recover the city, but was killed in the attempt, and in him ended the race of easterling princes in Ireland.

In 1172, Henry II. landed at Waterford, and obtained from Richard earl of Strongbow (who married the daughter of Dermot Mac Murrough, and by compact was his successor) a surrender of the city of Dublin, where he built a pavilion of wicker work near St Andrew's church, then situated where Cattlemarket lately stood, and there entertained several Irish princes, who voluntarily submitted to him, on condition of being governed by the same laws as the people of England. Henry also held a parliament here. In 1173 he granted his first charter to Dublin, and by divers privileges encouraged a colony from Bristol to settle here.

In 1210, upwards of 20 Irish princes swore allegiance to king John at Dublin; engaging to establish the English laws and customs in the kingdom; and in the same year courts of judicature were instituted. In 1216, magna charta was granted to the Irish by Henry III. an entry of which was made in the red book of the exchequer at Dublin. In 1217, the city was granted to the citizens in fee farm at 200 marks *per annum*; and in 1227 the above monarch ordained that the charter granted by king John should be kept inviolably. In 1404, the statutes of Kilkenny and Dublin were confirmed in a parliament held at this city under the earl of Ormond. The charter of the city of Dublin was renewed in 1609 by James I.

The civil government of the city was anciently un-

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der the management of a provost and bailiffs; in 1308, John le Dece was appointed the first provost, and Richard de St Olave and John Stakebold bailiffs. In 1409, the title of the chief magistrate was changed to that of mayor, when Thomas Cusack was appointed to the office, Richard Bove and Thomas Shortall being bailiffs: the office of bailiffs was changed to sheriffs in 1547. In 1600, Charles II. gave a collar of SS. and a company of foot guards to the mayor; and in 1605, this monarch conferred the title of lord mayor on the chief magistrate, to whom he also granted 500*l.* *per annum* in lieu of the foot company. Sir Daniel Bellingham was the first lord mayor of Dublin; Charles Lovet and John Quelsh were sheriffs the same year. In 1672, Arthur earl of Essex introduced new rules for the better government of the city; and in 1683 the Tholsel was built, for the purpose of the magistrates meeting to hold their courts, assemblies, &c.

In the 10th century, after the fortifications of Dublin were repaired by the Othmen, the walls of the city, including those of the castle, did not occupy more than an Irish mile; they extended from Winetavern-gate to Audcon's-arch, and were continued from thence to where Newgate formerly stood; and from a plan published by John Speed in 1610, it appears that they were continued to Ormond's-gate, or, as it has been since called, *Wormwood-gate*, from thence to the Old-bridge, and along the banks of the river to a very large portal called *Newman's tower*, nearly in the present site of the fourth entrance of Essex-bridge; and from Newman's tower in an angular direction to Dame's-gate, at the west-end of Dame-street. From the gate at the fourth angle of the castle the wall ran to Nicholas-gate, and was continued from thence to Newgate. The principal streets without the walls were, on the west, New-row, Francis-street, Thomas-street, and James's-street; on the south were Patrick-street, Bride-street, and Ship-street; and on the east Dame-street, George's-lane, and Stephen-street. That space of ground now occupied by Crane-lane, Temple-bar, Fleet-street, Lazar's-hill, or, as it is now called *South Townsend-street*, Crampton, Aston's, George's, and Sir John Rogerson's quays, &c. was then overflowed by the Liffey. On the north side of the river there were only Church-street, Mary's-lane, Hammond-lane, and Pill-lane, then built but on one side as far as Mary's-abbey, which terminated the extent of that part of the town to the eastward; Grange-Gorman, Stoney-batter, now called *Manor-street*, and Glasmanogue, were then villages at some distance from the city; and at the latter the sheriffs have held their courts in times of the plague, as being remote from the stage of infection. In 1664, the inhabitants being numbered amounted to 2563 men and 2986 women, protestants; and 1202 men and 1406 women, Roman catholics, making in the whole 8159.

By comparing this account of the ancient state and boundaries of the metropolis with the following description of its present extent, population, and magnificence, an idea will be readily formed of the amazing increase and improvement it hath experienced within the present century.

Dublin is seated in view of the sea on the east, and a fine country which swells into gently rising eminences

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mences on the north and west, while it towers boldly up in lofty mountains that bound the horizon on the south. The city itself cannot be seen to full advantage on entering the harbour: but the approach to it from thence exhibits a fine prospect of the country for improvement and cultivation, interspersed with numerous villas, that have a most agreeable effect to enliven this delightful scene, which, beginning at the water's edge, is continued all over the coast to the northward of the bay as far as the eye can reach, and is finely contrasted by a distant view of the Wicklow mountains to the south, where the conical hills, called the *Sugar-loaves*, contribute not a little, by the singularity of their appearance, to embellish the landscape, so extensive and picturesque as not to be equalled by any natural scenery in Europe, but the entrance of the bay of Naples, to which it bears a very striking resemblance.

The form of Dublin is nearly a square, a figure that includes the largest area proportioned to its circumference. From the royal hospital at Kilmainham, at the western extremity of the town, to the east end of Townsend-street, the length is two miles and an half, and its greatest breadth is computed to be of the same extent: hence the city is about 10 miles in circumference. Its increase within the last twenty years has been amazing: it now contains about 22,000 houses, whose inhabitants are estimated at 156,000.

Dublin, with respect to its streets, bears a near resemblance to London. Some of the old streets were formerly narrow: but this defect is now in a great measure remedied by an act of parliament, passed in 1774, for opening the public avenues, taking down sign-posts, palisades, pent-houses, &c. new paving the streets, and flagging the foot passages: and, in 1785, another act passed for the better paving, cleansing, and lighting the city; in consequence of which an additional number of globes with double burners were put up at the distance of 36 feet from each other. These necessary improvements contribute exceedingly to the beauty and convenience of the metropolis: the new streets are wide and commodious, the houses lofty, uniform, and elegant; nor are several of the old streets totally deficient in these respects: Sackville-street, or the Mall, which, though built upwards of 40 years ago, has been included in the number of our new streets by all the late geographers (a self-evident proof that these writers had not even seen the city), is a noble avenue, with a gravel walk in the centre, enclosed by a wall of about three feet high; this walk is 36 feet and a half broad, and the distance between it and the palisades fronting the houses, on either side, is 42 feet and a half: when the new custom-house is completed, this street will be then a most desirable situation for wholesale merchants, not only on account of its proximity to that building, but its great depth in the rear. Some years ago, it was esteemed one of the finest public avenues in Europe: many of the new streets, however, in this city are now much superior to it in the magnificence and uniformity of the houses. Among these, on the north side of the river, in the same quarter with Sackville-street, are Gardiner's-row, north Great George's-street, Cranby-row, Cavendish-row, and Palace-row: the last three form a superb square, having the garden of the lying-in-hospital in the

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centre: the old wall that encompassed the garden has been lately taken down; there is now a full view of this delightful spot surrounded with iron palisades, and upward of 100 globes with double burners disposed at equal distances, which, added to the globes from the surrounding houses, have a most brilliant effect. This square, which, for its size, is not perhaps to be equalled, has lately received the name of Rutland-square, in compliment to his grace the present duke of Rutland, who contributed munificently towards the improvements in the enclosure of the new garden, and the erecting an elegant edifice for a ball and supper rooms, now nearly finished, situated to the east of the hospital.

Among the new streets and buildings on the south side of the river, those wherein persons of distinction reside, lie chiefly to the eastward of the college and Stephen's-green; which last, though it does not rank with the new buildings, possesses much grandeur and elegance, being one of the largest squares in Europe: it is an English mile in circumference, surrounded by a gravel walk planted on each side with trees; within this walk is a smooth level meadow, having in the centre an equestrian statue of the late king: there are several fine edifices, though almost all differing in the style of their architecture; this variety, however, is esteemed by many rather a beauty than a defect: but, besides the other streets and buildings in this quarter, there is a new square which will be nearly as extensive as Stephen's-green, called *Merion-square*; it was laid out some years ago, by the late lord Fitzwilliam; the buildings are now considerably advanced, and great encouragement has been given by the present noble proprietor: the houses on the north side, which is quite finished, are uniform and lofty; most of them, being carried up with hewn stone to the first story, gives the whole an air of strength, beauty, and magnificence. At the south west angle of Stephen's-green, a new street has been also opened, called *Harcourt street*, in which are several elegant structures that merit notice, particularly the town residence of the right honourable lord Earlsford.

The principal entrance to the walks of Stephen's-green is on the west side opposite the end of York-street (which may be properly classed among the new streets), as all the old houses have been pulled down and modern buildings erected in their room. Those parts of the city inhabited by merchants and traders begin to wear a new face; and amongst this number the new buildings of Dame-street on the south side, exhibit an extensive, uniform, and beautiful range of houses all of an equal height: the shop doors and windows are formed by arches, exactly similar in their construction and ornaments, which are simply elegant: when the other side of this street shall be rebuilt, it may be justly pronounced one of the first trading streets in Europe; and Parliament-street, which was built some years ago, is now nearly equal to any trading street in London.

The river Liffey, being banked in through the whole length of the town, exhibits spacious and beautiful quays, where vessels below the bridge load and unload before the merchants doors and warehouses: it is navigable as far as Essex-bridge. This bridge was first built in 1681, and took its name from the unfortunate

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tunate earl of Essex, then viceroy of Ireland. It was taken down in 1753, and rebuilt in an elegant form, after the model of Westminster bridge, but much better proportioned, and on a more secure foundation. It has five arches, the buttresses between which support semicircular niches that project from the parapet; there are ballustrades between these niches, and continued to the ends of the bridge, which is commodiously flagged for foot passages; the whole constructed with hewn stone in a very fine taste. There are four bridges besides this over the river; three of which have nothing to recommend them, further than the antiquity of the Old-Bridge, which was erected in this city at a very early period, when it had the name of *Dublin-Bridge*; it was rebuilt in 1428, since which time it received its present title. Bloody-bridge, built in 1671, was originally constructed with wood, and derives its present harsh appellation from an attempt to break it down, wherein four persons were killed. Ormond-bridge was built in 1684, during the Ormond administration. Arran-bridge, now called *Queen's-bridge*, was erected in the same year; but, being destroyed by the floods in 1763, was rebuilt of hewn stone, and finished in 1768. It consists of three arches, with flagged foot passages, stone ballustrades and ornamental decorations, in a handsome light style, admired by every amateur of the arts.

This city has 2 cathedrals, 18 parish churches, 2 chapels of ease, 15 Roman-catholic chapels, 6 meeting-houses for presbyterians, 1 for anabaptists, 4 for methodists, 2 for quakers, a church for French Calvinists, a Danish and a Dutch church, and a Jewish synagogue.

Christ-church, or the Holy Trinity, built in 1038 by Donat bishop of Dublin, to whom Sitricus the son of Amlave king of the Oldmen of Dublin granted the site for that purpose, stands on the summit of the rising ground at the head of Winchester-street. It is a venerable Gothic pile; and its present appearance evinces its antiquity. St Patrick's cathedral, first built by archbishop Comyn in 1190, and decorated by archbishop Minot in 1370, with a steeple on which a lofty spire was erected in 1750, is also a fine Gothic structure: it stands on the east side of Patrick-street; the monuments here are more numerous than in Christ-church; and the steeple is the highest in the city.

St Werburgh's church was originally built in a very early age. In 1301, when a great part of the city was consumed by an accidental fire, this church suffered in the conflagration: it was burnt a second time in 1754, and repaired in its present beautiful form in 1759. The front and steeple are admired for their elegance, lightness, and symmetry: the spire is a fine octagon supported by eight pillars; and a gilt ball terminates the whole, being 160 feet from the ground. Catharine's church first built in 1105, and re-edified in its present form in 1769, is situated on the south side of Thomas's-street. St Thomas's church is the latest foundation of the kind in this city, having been begun in the year 1758, and finished and consecrated in 1762. It is situated on the west side of Marlborough-street, opposite Gloucester-street, to which it forms an elegant termination. The other churches in this city are; on the north side of the ri-

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ver, Mary's, Michan's, and Paul's; on the south side, James's, Luke's, Kevin's, Peter's, Bride's, Nicholas within, Audon's, Michael's, Mark's, Anne's, John's, and Andrew's; this last is called also the *Round church*, from its form being exactly circular: most, if not all the others were built in an early age: many, however, have been since re-edified, and assumed a more modern form: some of these are not totally devoid of elegance, particularly Anne's. St John's in Fishamble-street was rebuilt in 1773, and has now a handsome front of hewn stone decorated with columns supporting a pediment. Besides these churches, Dublin is adorned with several other public buildings; the most remarkable of which are the following: The castle, the residence of the chief governor, built in 1213 by Henry de Londres, was formerly moated and flanked with towers; but the ditch has been long since filled up, and the old buildings raised, the chapel and wardrobe tower excepted, which still remain: Birmingham tower was rebuilt in 1777, and is now called *Harcourt tower*. The castle at present consists of two courts, the principal of which is an oblong square formed by four ranges of building: within a few years, in the middle of the fourth range, a handsome edifice called *Bedford tower* has been erected; the front is decorated with a small arcade of three arches, over which is a colonnade supporting a pediment, from whence rises an octagon steeple crowned with a small cupola and gilt ball in a light pleasing style. This tower, which fronts the entrance to the viceroy's apartments, is connected with the buildings on each side by two fine gates; over that on the right hand is a statue of Fortitude; and over the left gate, which is the grand portal to the upper court, is the statue of Justice. In the lower court are the treasury and other offices, with military stores, an arsenal and armory for 40,000 men, and a barrack in which a captain's detachment of infantry are stationed. Between this barrack and the arsenal is the cattle garden; opposite to which, at the rear of the lord Lieutenant's apartments, is a range of building called the *Garden-front*, erected about the year 1740, finished in mountain stone, ornamented by semicolumn of the Ionic order, and the windows embellished with cornices and architraves, in a fine taste. The ball-room is now titled *St Patrick's Hall*. The viceroy's body guard consists of a captain, two subalterns, and sixty private men, with a subaltern's guard of horse. The parliament house, a most superb structure, is situated on the north side of college-green: it was begun in 1729, finished in 10 years, and cost 40,000*l*. it is built with Portland stone, and the front formed by a grand portico of Ionic columns in the most finished style of architectural elegance: the internal parts (which have been lately much improved, under the auspices of the present speaker the right honourable John Forster) correspond with its outward magnificence; and the manner in which the inside is lighted is universally admired. The house of commons is an octagon, covered with a dome supported by columns of the Ionic order, that rise from an amphitheatrical gallery ballustraded with iron scroll-work: this room is admirably well adapted to its purpose. The house of lords is an oblong room, spacious and lofty, and ornamented in a superb manner: it is also judiciously adapted for the reception of the august assembly which meet

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there: among other decorations are two pieces of tapestry, representing the battle of the Boyne and siege of Derry, allowed to have much merit. By order of both houses of parliament, a grand new front has been lately erected on the east side of this magnificent pile; and preparations are making to front the north and west sides in a similar manner, from a design of Mr Gandon's: thus insulanted, the whole will form a suite of senatorial apartments matchless in elegance and convenience.

The College founded by queen Elizabeth in 1591 is situated at the east end of College-green. It is a most beautiful structure, consisting of two spacious squares, the first of which contains the refectory, the old hall and chapel, and the new theatre for lectures and examinations; the front of this last building is finely decorated with Corinthian columns supporting a pediment; and over the front of the old hall, on the east side of this square, a handsome steeple rises crowned with a cupola. In the other square, which consists partly of brick buildings for the students, there is a superb library, extending through its whole length on the south side: behind this square there is a fine park. The west side of the first square, which is built with Portland stone, forms the grand front, upward of 300 feet in length, ornamented with Corinthian pillars and other decorations in a very fine taste. At a small distance to the fourth side of this front is an elegant edifice in which the provost resides. The printing-office is a neat handsome structure on the north side of the park; and opposite to it is the anatomy house, in which are to be seen the celebrated wax models of the human figure, executed at Paris by M. Douane, purchased by the right honourable the earl of Shelburne, and presented to this university. The college of Dublin is an university in itself, consisting of a provost, vice-provost, 7 senior and 15 junior fellows, and 17 scholars of the house; the number of students is generally about 400: it has also professors in divinity, common and civil law, physic, Greek, modern languages, mathematics, oriental tongues, history and oratory, modern history, natural philosophy, anatomy and surgery, chymistry, and botany. His royal highness the duke of Gloucester is chancellor, and his grace the lord primate of Ireland vice-chancellor: the visitors are the chancellor (or, in his absence, the vice-chancellor) and the archbishop of Dublin.

The Royal Exchange, situated on Cork-hill, was begun in 1769, and opened for business in 1779: the expence, amounting to £.40,000, being defrayed by lottery schemes, conducted by the merchants of Dublin with an integrity that did them honour. The building is nearly a square, having three fronts of Portland stone in the Corinthian order, and crowned in the middle with a fine dome, which is supported on the inside by 12 composite fluted pillars that form a circular walk in the centre of the ambulatory: above these pillars are 12 circular windows, and the ceiling of the dome, which is ornamented with stucco, in the Mosaic style, has also a large window in the middle that illumines most of the building. Opposite the north entrance, in the circular walk, is a statue of his present majesty George III. in a Roman military habit; it is

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executed in bronze by Van Nolt, and elevated on a white marble pedestal: in a niche on the stair-case leading to the coffee-room is a white marble statue of the late Dr Charles Lucas, executed by Smyth. The north front, which commands a fine view of Parliament-street and Essex-bridge, is embellished by a range of six columns and their correspondent pilasters, supporting a grand pediment with a balustrade on each side: a flight of stone steps leads from the street to the entrance, which is by three fine iron-railed gates: the west front varies but little from the north, except in the want of a pediment, and having only three steps ascending to the entrance, the ground on that side being nearly on a level; this front is opposite the east end of Castle-street near the principal entrance to the Castle.

The Hospital for Lying-in-Women, founded by Dr Bartholomew Mosse, and opened in 1757, stands on the north side of Great Britain street. The building is extremely light and elegant; a beautiful steeple rises in the centre, and the wings are formed by semicircular colonnades on each side. Adjoining the east colonnade is the Rotunda, where balls and assemblies are held, and concerts performed, for the benefit of the charity: close to it are now erecting the grand suite of apartments before mentioned. The garden at the rear of the hospital is laid out in a good taste.

The Blue-coat Hospital was founded on the west side of Queen-street by Charles II. in 1670, for educating the children of reduced freemen of the city: but the original building being greatly decayed, was taken down, and the new Blue-coat Hospital, situated in Oxmantown-green, was begun in 1773. The front is enriched by four Ionic columns, supporting a pediment in the centre, over which the steeple rises, embellished with Corinthian and Composite columns in an admired taste. Connected with the front by circular walls ornamented with balustrades and niches, are the school on one side and the church on the other: these form two well proportioned wings; they are of a similar construction; and each is crowned with a small steeple or turret, corresponding with the rest in uniform harmony and beauty.

The Barracks, the foundation of which was laid in 1704, are esteemed the largest and most commodious in Europe. They consist of four squares, situated at the west end of the town, on the north side of the river. The royal square in the centre, with the horse barrack and the little square on each side, form a spacious and extensive front to the south: the palatine, now called the new square, is opposite to Oxmantown-green; it has been lately rebuilt with hewn stone in a very elegant manner.

The Royal Hospital at Kilmalnam for the support of invalids of the Irish army was founded by king Charles II. on a plan similar to that of Chelsea in England. The building was completed in 1683, and cost upwards of £.23,500. It is situated at the west end of the town on a rising ground near the south side of the river, from whence there is an easy ascent to it through several rows of tall trees. This edifice is of a quadrangular form, inclosing a spacious area handsomely laid out in grass-plots and gravelled walks: an arcade is carried along the lower story in each square to the entrance of the hall and chapel, which are both

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curiously decorated; in the former are several whole-length portraits of royal personages and other distinguished characters.

Dr Stevens's Hospital, the foundation of which was laid in 1720, is a neat quadrangular building, pleasantly situated on the banks of the river near the west end of James's street, from whence a gravelled walk leads by a gentle descent to the entrance of the hospital, and is continued from thence to the water's edge.

The Linen-hall, at the north end of Linen-hall street, which was opened at the public expence in 1728 for the reception of linen cloths brought to the Dublin market, is a handsome building, lately enlarged with treble its number of former rooms, which furnish a new proof of commercial prosperity.

The New Prison in Green-street, the first stone of which was laid in 1773, is a large quadrangular structure, designed and executed under the direction of the late Mr Cooley. The east front consists of a centre break of mountain stone rusticated and crowned by a pediment, with a plain facade of black limestone on each side; and at the external angles of the building are four round towers.

There are many other public edifices in this city and its environs which merit particular notice. The Hospital for Lunatics in west Bow-lane, founded by Dean Swift, and opened in 1757; the Hibernian School in the Phoenix Park, and the Marine School on Sir John Rogerfon's Quay, the first for educating the poor children of soldiers, and the other for bringing up to the sea service the sons of deceased or disabled seamen; the Hospital for Incurables in south Townsend-street; Mercer's Hospital in Stephen-street; the Meath Hospital on the Coombe; and Simpson's Hospital in Great Britain street, the last of which was established for the reception of blind and gouty men; are all handsome edifices constructed of hewn stone in the modern style.

To these public buildings may be added St Nicholas's Hospital in Francis-street; the Infirmary for sick and wounded soldiers of the army, and the Foundling Hospital in James's-street; the Magdalen Asylum in Leeson-street; and the House of Industry in Chancery-row; the halls for corporations (particularly the Weavers Hall on the Coombe, over the entrance of which is a statue of his late majesty George II.); the Tholsel; the old Four Courts; the old Customhouse; and several others. The Charitable Infirmary, which was first opened in 1728 and rebuilt in 1741, stood on the Inn's Quay, but has lately been pulled down, together with most of the houses on that quay, where the new courts of justice are to be erected: and the benefits of this humane institution are now dispensed to the public at a house taken for that purpose in Jervis-street. The new courts of justice, which will be a principal ornament to the metropolis, are from a design of Mr Gandon's, as is also the new Customhouse, now nearly finished on the north wall. This front extends 375 feet, enriched with arcades and columns of the Doric order, crowned with an entablature: the centre has a portico finished with a pediment, in which is a bas-relief of emblematical figures alluding to commerce: over the pediment is an attic story; and a magnificent dome finishes the centre, whereon is a pedestal supporting a statue of Commerce: the key-stones over the entrances and in the centre of the pavilions are deco-

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rated with emblematical heads representing the produce of the principal rivers of Ireland: the south or front to the river, with the arms of Ireland over each pavilion, is of Portland stone: the whole, being formed of large and striking parts, adds much to the picturesque scene of the river, and will remain a lasting monument of reputation to the several artists employed in this superb building.

The playhouses, considered as public buildings, have nothing to recommend them to notice. One only, viz. the old house, now the theatre-royal, in Smock-alley, is kept open by Mr Daly; who, in consequence of the bill passed last session of parliament for the regulation of the stage, enjoys the exclusive privilege of managing and directing the theatrical exhibitions in this metropolis. The playhouse in Crow-street, which formerly possessed the distinction of theatre-royal, has been shut up these several years past.

But a minute description of every public edifice would occupy more room than this publication admits, not to mention the several private houses, justly admired for their elegance. Among these are:

Leinster-house, the town residence of his grace the Duke of Leinster. The entrance to this princely mansion is from Kildare-street, through a grand gateway of rustic stone work, into a spacious court which forms a segment of a circle before the principal front. The inside of this magnificent structure is equal to its exterior appearance; the hall lofty and noble; and the apartments decorated and furnished in a splendid taste, and enriched with several very valuable paintings. The garden front, plain yet bold, possesses a pleasing simplicity; the garden is spacious and elegant, with a beautiful lawn in the centre. The whole of this building is inferior to few private edifices in the British dominions.

The Earl of Charlemont's house is finely situated in the middle of Palace-row, on an eminence exactly fronting the centre of the garden at the rear of the Lying-in-Hospital. The front is built with hewn stone brought from Arklow, superior to that of Portland. The inside of this house is superb and convenient: the hall ceiling is supported by columns; some of the apartments are decorated with a select but choice collection of paintings of the best masters; among which are one of Rembrandt's finest pictures, representing Judas repenting and casting the silver pieces on the ground; a portrait of Cæsar Borgia, by Titian; and the Lady's Last Stake by Hogarth, &c. &c. The library is esteemed one of the finest apartments in Dublin, and contains a very valuable collection of the best authors. At one end of it is an anti-chamber, with a fine statue in white marble of the Venus de Medicis by Wilton; and at the other end are two small rooms, one a cabinet of pictures and antiquities, the other of medals: it is situated at the rear of the house, and connected with it by a corridor, in which are some handsome statues and Egyptian curiosities.

Dublin, which is the seat of government and of the chief courts of justice, has received many charters and ample privileges from the kings of England since the reign of Henry II. who introduced the English laws into this kingdom. Richard II. erected it into a marquisate in favour of Robert de Vere Earl of Oxford, whom he also created Duke of Ireland. It is an archie-

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archiepiscopal see, and returns with the university and the county six members to parliament. The civil government of Dublin is executed by a lord-mayor, recorder, two sheriffs, twenty-four aldermen, and a common council formed of representatives from the twenty-five corporations. Every third year the lord-mayor, in conformity with an old charter, perambulates the bounds of the city and its liberties; and formerly the freemen of the several corporations, armed and mounted on horseback, were accustomed to attend the chief magistrate on this occasion, which was titled riding the franchises: but as this custom was productive of idleness, intoxication, and riots, among the lower orders of the people, it has been of late years very properly laid aside. Besides the silk, woollen, and worsted manufactures carried on in that quarter of the suburbs called the Earl of Meath's Liberty, and which have been considerably improved within these few years, other branches of useful manufacture are establishing in different parts of the metropolis; and though the trade of Dublin has heretofore consisted chiefly in the importation of foreign commodities, yet, now that the restrictions on their woollens and mols of their other goods are removed, it is hoped the daily enlargement of their export trade will cause a proportionable increase of national opulence.

Dublin would have had a commodious station for shipping, were it not that the harbour is choaked up with two banks of sand, called the *North and South Bulls*, which prevent vessels of large burden from coming over the bar. This, however, is in some measure remedied by a prodigious work of stone, and piles of wood extending some miles into the bay on the south side, at the end of which there is a light-house, beautifully constructed, after a design of the late Mr Smith's. But the port of Dublin is capable of much greater improvement; particularly by turning the course of the river Dodder, building a mole from the north-wall to Ringsend, and clearing the harbour, so as to form a grand basin on the south side for the reception of vessels of all burthens. This work is to be immediately carried into execution, and will no doubt meet every possible encouragement, from that spirit for promoting the national welfare which now prevails throughout this kingdom, and is remarkably conspicuous in the capital, where, among others, are the following public institutions.

The board of trustees for promoting the linen and hemp manufactures, established by act of parliament. The Dublin society, incorporated by charter in the year 1749, for improving husbandry and other useful arts. The royal college of physicians, established in the year 1679 for promoting of medical knowledge. The royal college of surgeons, instituted in the year 1785. The royal Irish academy, for the advancement of science, polite literature, and antiquities, incorporated by letters patent the 28th of January 1786: His majesty is patron, and the chief governor for the time being is visitor. The Hibernian society, for maintaining, educating, and apprenticing, the orphans and children of soldiers in Ireland. The Hibernian marine society, for maintaining, educating, and apprenticing, the orphans and children of decayed seamen in his majesty's navy and the merchants service, also incorporated by royal charter.

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But among these public institutions, that of the bank of Ireland must not be omitted: it was established by act of parliament in 1783; and by facilitating the circulation of specie, gives life and vigour to manufactures and commerce. It is conducted under the management of a governor, deputy-governor, and fifteen directors chosen annually from among the subscribers; with this restriction, that five new directors at least must be chosen every year. This bank is kept in Mary's-abbey. There are four other banks in this city under the following firms, *viz.* Right Honourable David La Touche and Co. and Sir William Gleadowe Newcomen, Bart. and Co. both in Castle-street; John Dawson Coates, Esq; Thomas-street; and John Finlay and Co. upper Ormond-quay. The houses in which the first three are kept are structures worthy of notice, particularly that of Sir William Gleadowe Newcomen's, which has been rebuilt with hewn stone, in a good taste, after a design of the late Mr Ivory's.

To these public institutions may be added the General Post-Office of Ireland, established by act of parliament in 1784, previous to which time the post-office of this kingdom was only considered a branch of the English one. The building erected for this purpose is on the south side of College-green: it is a fine lofty extensive structure, and the offices for clerks, &c. are extremely well adapted. There are two post-masters general, a secretary, treasurer, accountant-general, resident surveyor, and comptroller. There is also a penny-post under the direction of the same officers, established for the conveyance of letters to all parts throughout the city and its environs.

Dublin is remarkably well supplied with fesh, fowl, and fish, the latter in much greater perfection than any other capital in Europe. It is supplied with coals chiefly from Cumberland and Scotland; and water is conveyed to the city on the north side from the river Liffey, by machines curiously constructed for the purpose, at an outlet called *Island-bridge*: the south side is supplied with that necessary article from a fine reservoir or basin, surrounded with a wall and a handsome grass walk enclosed on each side by a thick-set hedge and trees planted at equal distances. From one end of it there is a view of the canal for the convenience of inland water carriage, now completed as far as Monastereven, between which and the canal harbour in James's-street, passage-boats ply daily; they are well appointed and accommodated with all necessary refreshments. At a small distance from the basin there is a bridge of a single arch thrown over the canal, the elegance and architecture of which are much admired: the sides of the canal for some miles into the country are planted with elm-trees, which renders its banks in fair weather a delightful place of exercise for the citizens; who also resort for recreation to his majesty's Phoenix-park, a fine extensive enclosure at the west end of the town and on the opposite side of the river to the canal, diversified with woodland, campaign, and rising ground, and well stocked with deer. It is seven miles in circuit; and besides the Hibernian school, is adorned with the viceroy's beautiful villa and some handsome lodges belonging to the rangers: in this park are also a magazine for powder and a battery that commands the city. In 1747, a fluted pillar 30 feet high, with a phoenix on the top, was erected in the

centre of a ring in this park by the celebrated earl of Chesterfield when lord lieutenant of Ireland.

The circular road which furrounds the city, beginning on one side of the river, at the east end of the town, and terminating on the opposite shore, is carried through the park. This road forms a very agreeable ride, and is much frequented. It is the boundary of the jurisdiction of the new police, instituted for the better preservation of the peace and good order of the city and the personal security of its inhabitants. This institution, lately established by act of parliament, is under the direction of a chief commissioner, three assistant commissioners, and four divisional justices, who are all aldermen of the city: which is therefore properly termed the *dybistr* of the metropolis, and divided into four wards. The police-guard consists of 40 horsemen and 400 foot, well armed, and in regular uniform: they are taught military discipline, and stationed at night-time in the several watch-houses; from whence parties are constantly patrolling the streets, and sentinels are placed at different stands. This institution is found by experience to be a much more effectual prevention of robberies, riots, and nocturnal outrages, than the parish watches; and to this security which the well disposed working manufacturers enjoy, may in a great measure be attributed that encreasing spirit of industry and peaceable behaviour now so prevalent among this useful class of the community, which cannot fail to be productive of the most salutary consequences to the future welfare of the metropolis and the kingdom in general.

DUBOS (John Baptiſt), a learned and ingenious French author, born at Beauvais in 1670. He finished his studies at Paris, and at length was intrusted with the management of several important affairs in Italy, England, and Holland. At his return to Paris, he had a prebendary given him; afterwards he had a pension of two thousand livres, and the abbey of Notre Dame at Reſſons, near Beauvais. He died at Paris, when perpetual secretary of the French academy, on the 23d of March 1742. His principal works are, 1. *Critical Reflections on Poetry and Painting*, in three volumes duodecimo. 2. *A Critical History of the French Monarchy in Gaul*, two volumes 4to.

DUBRIS (anc. geog.), a town of Britain; now *Dover*, from the *Doveria* of the lower age. A port town of Kent, opposite to Calais.

DUCAL, in general, something belonging to a duke. See DUKE.

The letters patent granted by the senate of Venice are called *ducals*: so also are the letters wrote, in the name of the senate, to foreign princes. The denomination of ducal is derived hence; that, at the beginning of such patents, the name of the duke or doge is wrote in capitals, thus, *N—Dei Gratia Dux Venetiarum*, &c. The date of ducals is usually in Latin, but the body is in Italian. A courier was dispatched with a ducal to the emperor, returning him thanks for renewing the treaty of alliance (in 1716), against the Turks, with the republic of Venice.

DUCAS, a learned Greek, who wrote an history of what passed under the last emperors of Constantinople, till the ruin of that city. This work, which is esteemed, was printed at the Louvre in 1649, with the Latin translation and notes of Bouillaud.

DUCAT, a foreign coin, either of gold or silver,

struck in the dominions of a duke; being about the same value with a Spanish piece of eight, or a French crown, or four shillings and sixpence sterling when of silver; and twice as much when of gold. See COIN.

The origin of ducats is referred to one Longinus, governor of Italy; who, revolting against the emperor Justin the Younger, made himself duke of Ravenna, and called himself *Exarcha*, i. e. *without lord or ruler*; and, to show his independence, struck pieces of money of very pure gold in his own name, and with his own stamp, which were called *ducats*, *ducats*; as Procopius relates the story.

After him, the first who struck ducats were the Venetians, who called them *Zecchini* or *seguins*, from Zecca, the place where they first were struck. This was about the year 1280, in the time of John Danduli: but we have pretty good evidence, that Roger king of Sicily had coined ducats as early as 1240. And Du Cange scruples not to affirm, that the first ducats were struck in the duchy of Apulia in Calabria. The chief gold ducats now current are, the single and double ducats of Venice, Florence, Genoa, Germany, Hungary, Poland, Sweden, Denmark, Flanders, Holland, and Zurich. The heaviest of them weighs 5 pennyweights 17 grains, and the lightest 5 pennyweights 10 grains; which is to be understood of the double ducats, and of the single in proportion.

The Spaniards have no ducats of gold; but, in lieu thereof, they make use of the silver one; which, with them, is no real species, but only a money of account like our pound. It is equivalent to 11 rials. See RIAL. The silver ducats of Florence serve there for crowns.

DUCATOON, a silver coin, struck chiefly in Italy; particularly at Milan, Venice, Florence, Genoa, Lucra, Mantua, and Parma: though there are also Dutch and Flemish ducatoons. They are all nearly on the same footing; and being a little both finer and heavier than the piece of eight, are valued at two pence or three pence more, viz. at about four shillings and eightpence sterling.

There is also a gold ducatoon, struck and current chiefly in Holland: it is equivalent to twenty florins, on the footing of one shilling and eleven pence halfpenny the florin.

DUCENARIUS, in antiquity, an officer in the Roman army, who had the command of 2000 men.

The emperors had also *ducenarii* among their procurators or intendants, called *procuratores ducenarii*. Some say, that these were such whose salary was two hundred sesterces; as in the games of the circus, horses hired for two hundred sesterces were called *ducenarii*. Others hold, that *ducenarii* were those who levied the two hundredth penny, the officers appointed to inspect the raising of that tribute. In the inscription at Palmyra, the word *ducenarius*, in Greek *δουκηνάριος*, occurs very often.

DUCENTESIMA, in antiquity, a tax of the two hundredth penny, exacted by the Romans.

DUCHAL (James), D. D. a late pious and learned dissenting minister, was born in Ireland, and finished his studies at the university of Glasgow; which afterwards, from a regard to his merit, conferred on him the degree of doctor of divinity. He resided 10 or 11 years at Cambridge, as the pastor of a small congregation there; where he enjoyed his beloved retirement, the

Ducky,
Duck

the advantage of books and of learned conversation, which he improved with the greatest diligence. On Mr Abernethy's removal from Antrim, he succeeded him there; and on that gentleman's death, he succeeded him as minister of the dissenting meeting-house in Wood-street, Dublin. In this situation he continued till his death, which happened on the 4th of May 1761, when he had completed his 64th year. He published a volume of excellent discourses on the presumptive arguments in favour of the Christian religion, and many occasional tracts; and after his death were published a number of his sermons, in three volumes 8vo.

DUCHY, in geography, an appellation given to the dominions of a duke.

Duchy Court, a court wherein all matters belonging to the duchy or county palatine of Lancaster are decided by decree of the chancellor of that court.

The origin of this court was in Henry the IV.'s time, who obtained the crown by deposition of Richard II. and having the duchy of Lancaster, by descent, in right of his mother, became seized thereof as king, not as duke: So that all the liberties, franchises, and jurisdictions of the said county passed from the king, by his great seal, and not by livery or attornment, as the earldom of March, and other possessions, which descended to him by other ancestors than the king's did. Henry IV. by authority of parliament, seized the possessions, liberties, &c. of the said duchy from the crown; but Edward IV. restored them to their former state.

The officers belonging to this court are, a chancellor, attorney-general, receiver-general, clerk of the court, and messenger; beside the assistants, as an attorney in the exchequer, another in chancery, and four counsellors.

DUCK, in ornithology. See ANAS and DECOY.

This fowl is furnished with a peculiar structure of vessels about the heart, which enables it to live a considerable time under water, as is necessary for it in diving. This made Mr Boyle think it a more proper subject for experiments with the air-pump than any other bird. A full grown duck being put into the receiver of an air-pump, of which she filled one third part, and the air exhausted, the creature seemed to bear it better for the first moments than a hen or other fowl; but, after about a minute, she showed great signs of uneasiness, and in less than two minutes her head fell down, and she appeared dying, till revived by the letting in of the air. Thus, whatever facility of diving this and other water-fowl may have, it does not appear that they can subsist, without air for respiration, any longer than other animals. A young callow duck was afterwards tried in the same manner, and with the same success, being reduced very near death in less than two minutes. But it is observable, that both birds swelled very much on pumping out the air, so that they appeared greatly larger to the spectators, especially about the crop; it not being intended that any water-fowl should live in an exceedingly rarefied air, but only be able to continue occasionally some time under water. Nature, though she has provided them with the means of this, has done nothing for them in regard to the other.

The strongest instance of these creatures being calculated to live aloft in any situation, we have in the

Duck,
Ducking.

accounts of the blind ducks in the Zirchnitzer lake in Carniola. It is supposed that this lake communicates with another lake under ground in the mountain Savornie, and fills or empties itself according to the fullness or emptiness of that lake; the water of the upper lake running off, and that in vast quantities, by holes in the bottom. The ducks, which are here always in great numbers, are often carried down along with the water, and forced into the subterraneous lake to which it retires. In this unnatural habitation, many of these creatures undoubtedly perish, but some remain alive. These become blind, and lose all their feathers; and in the next filling of the lake, both they and vast numbers of fish are thrown up with the water. At this time they are fat, but make a strange appearance in their naked state, and are easily caught, by reason of their want of sight. In about a fortnight they recover their sight and feathers; and are then of the size of a common wild-duck, but of a black colour, with a white spot in their forehead. When opened, on being taken at their first coming up in their blind state, their stomachs are found full of small fishes, and somewhat resembling weeds. From this it seems, that they cannot be absolutely blind; but that the degree of light to which they have been accustomed in their subterraneous habitation, was sufficient to enable them to procure food for themselves; and their blindness, on coming again into open day-light, is no other than that of a man who has been long in the dark, on having in an instant a large blaze of candles set under his eyes.

DUCK (Stephen), originally a thresher in a barn, was born about the beginning of the present century. By his poetical talents he first attracted the notice of some gentlemen at Oxford; and being recommended to Queen Caroline, he, under her patronage, took orders, and was preferred to the living of Byfleet in Surrey. His abilities were, however, much more conspicuous in his primitive station than in his advancement; though, it is said, he was not disliked as a preacher. Falling at length into a low-spirited melancholy way, probably owing to his change of life and cessation from his usual labour, he in a fit of lunacy flung himself into the Thames, in 1756.

DUCKING, plunging in water, a diversion anciently practised among the Goths by way of exercise; but among the Celts, Franks, and ancient Germans, it was a sort of punishment for persons of scandalous lives.—At Marfeilles and Bourbon their men and women of scandalous life are condemned to the cales, as they call it; that is, to be shut up naked to the shift in an iron cage fastened to the yard of a shallop, and ducked several times in the river. The same is done at Thoulouze to blasphemers.

DUCKING, a sort of marine punishment, inflicted by the French, on those who have been convicted of desertion, blasphemy, or exciting sedition. It is performed as follows: The criminal is placed atride of a short thick batten, fastened to the end of a rope, which passes through a block hanging at one of the yard-arms. Thus fixed, he is hoisted suddenly up to the yard, and the rope being slackened at once, he is plunged into the sea. This chastisement is repeated several times conformable to the purport of the sentence pronounced against the culprit, who has at that time several cannon-shot fastened to his feet during the punishment; which

Ducking
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Dudley.

which is rendered public by the firing of a gun, to advertise the other ships of the fleet thereof, that their crews may become spectators.

DUCKING is also a penalty which veteran sailors pretend to inflict on those who, for the first time, pass the tropic of Cancer, the equator, or the straits of Gibraltar, in consequence of their refusal or incapacity to pay the usual fine levied on this occasion.

DUCKING-STOOL. See CASTIGATORY.

DUCKUP, at sea, is a term used by the steer'sman, when the main-sail, fore-sail, or sprit-fail, hinders his seeing to steer by a land-mark: upon which he calls out, *Duckup the clew-lines of these sails*; that is, hale the sails out of the way. Also when a shot is made by a chase-piece, if the clew of the sprit-fail hinders the sight, they call out, *Duckup*, &c.

DUCT, in general, denotes any tube or canal. It is a term much used by anatomists.

DUCTILITY, in physics, a property possessed by certain solid bodies, which consists in their yielding to percussion or pressure, and in receiving different forms without breaking.

Some bodies are ductile both when they are hot and when they are cold, and in all circumstances. Such are metals, particularly gold and silver. Other bodies are ductile only when heated to a sufficient degree; such as wax and other substances of that kind, and glass. Other bodies, particularly some kinds of iron, called by the workmen *red-hot*, brass, and some other metallic mixtures, are ductile only when cold, and brittle when hot. The degrees of heat requisite to produce ductility in bodies of the first kind, vary according to their different natures. In general, the heat of the body must be such as is sufficient to reduce it to a middle state betwixt solidity and perfect fusion. As wax, for instance, is fusible with a very small heat, it may be rendered ductile by a still smaller one; and glass, which requires a most violent heat for its perfect fusion, cannot acquire its greatest ductility until it is made perfectly red-hot, and almost ready to fuse. Lastly, some bodies are made ductile by the absorption of a fluid. Such are certain earths, particularly clay. When these earths have absorbed a sufficient quantity of water to bring them into a middle state betwixt solidity and fluidity, that is to the consistence of a considerably firm paste, they have then acquired their greatest ductility. Water has precisely the same effect upon them in this respect that fire has upon the bodies above mentioned.

DUDLEY (Edmund), an eminent lawyer and able statesman in the reign of Henry VII.; who with Sir Richard Empson, another lawyer of the same complexion, assisted in filling that rapacious monarch's coffers by arbitrary prosecutions of the people on old penal statutes. They were beheaded on the accession of Henry VIII. to pacify the clamours of the people for justice.

DUDLEY (John), duke of Northumberland, son of the above, a statesman; memorable in the English history for his unsuccessful attempt to place the crown on the head of his daughter-in-law, lady Jane Grey, who fell a victim to his ambition; was born in 1502, and beheaded in 1553. See (*History of*) ENGLAND. Ambrose his eldest son was a brave general and able statesman under queen Elizabeth; and received the ap-

pellation of the *good earl of Warwick*. Henry, the duke's second son, was killed at the siege of St Quintin. Robert, the third son, a man of bad character, was created earl of Leicester; and was one of queen Elizabeth's favourites. His fourth son was the unfortunate lord Gifford Dudley, whose only crime was his being the husband of lady Jane Grey, for which he was beheaded in 1554.

DUDLEY (Sir Robert), as he was called in England, and, as he was styled abroad, *earl of Warwick and duke of Northumberland*, was the son of Robert above mentioned, by the lady Douglas Sheffield; and was born at Sheen in Surry in 1573, where he was carefully concealed, to prevent the queen's knowledge of the earl's engagements with his mother. He studied at Oxford; when his father dying, left him the bulk of his estate. He was at this time one of the finest gentlemen in England; and having a particular turn to navigation, fitted out a small squadron at his own expence, with which he failed to the river Oronoque, and took and destroyed nine sail of Spanish ships. In 1595, he attended the earl of Essex, and the lord high admiral of England, in their expedition against the Spaniards; when, for his gallant behaviour at the taking of Cadix, he received the honour of knighthood. He now endeavoured to prove the legitimacy of his birth, in order to be intitled to his hereditary honours. But being overpowered by the interest of the countess dowager of Leicester, he applied for a licence to travel; and being well received at the court of Florence, resolved to continue there, notwithstanding his receiving a letter of recall; on which his whole estate was seized by king James I. and vested in the crown. He discovered at the court of Cosmo II. great duke of Tuscany, those great abilities for which he had been admired in England, and was at length made chamberlain to his serene highness's consort. He there contrived several methods of improving shipping; introduced new manufactures; and by other services obtained so high a reputation, that at the desire of the archduchess, the emperor Ferdinand, in 1620, created him a duke of the holy Roman empire. He afterwards drained a vast tract of morass between Pisa and the sea; and raised Leghorn, which was then a mean, pitiful place, into a large and beautiful town, improving the haven by a mole, which rendered it both safe and commodious; and having engaged his highness to declare it a free port, he, by his influence and correspondence, drew many English merchants to settle and set up houses there, which was of very great service to his native country, as well as to the Spaniards. He was also the patron of learned men, and held a high place himself in the republic of letters. His most celebrated work is his *Del Arcano del Mare*, in two volumes, folio.

DUEL, a single combat, at a time and place appointed, in consequence of a challenge. This custom came originally from the northern nations, among whom it was usual to decide all their controversies by arms. Both the accuser and accused gave pledges to the judges on their respective behalf; and the custom prevailed so far amongst the Germans, Danes, and Franks, that none were excused from it but women, sick people, cripples, and such as were under 21 years of age or above 60. Even ecclesiastics, priests, and monks, were

Dudley,
Duel.

Duel.

were obliged to find champions to fight in their stead. The punishment of the vanquished was either death, by hanging or beheading; or, mutilation of members, according to the circumstances of the case. Duels were at first admitted not only on criminal occasions, but on some civil ones for the maintenance of rights to estates, and the like: in latter times, however, before they were entirely abolished, they were restrained to these four cases. 1. That the crime should be capital. 2. That it should be certain the crime was perpetrated. 3. The accused must by common fame be supposed guilty. And, 4. The matter not capable of proof by witnesses.

DUEL, at present, is used for single combat on some private quarrel; and must be premeditated, otherwise it is called a *rencontre*. If a person is killed in a duel, both the principals and seconds are guilty, whether the seconds engage or not. (See the article MURDER.) It is also a very high offence to challenge a person either by word or letter, or to be the challenger of a challenge, (See LAW, n^o cxxxv. 20.)

The general practice of duelling, in this last sense, took its rise in the year 1527, at the breaking up of a treaty between the emperor Charles V. and Francis I. The former desired Francis's herald to acquaint his sovereign, that he would henceforth consider him not only as a base violator of public faith, but as a stranger to the honour and integrity becoming a gentleman. Francis, too high-spirited to bear such an imputation, had recourse to an uncommon expedient to vindicate his character. He instantly sent back the herald with a cartel of defiance, in which he gave the emperor the lie in form, challenged him to single combat, requiring him to name the time and place of the encounter, and the weapons with which he chose to fight. Charles, as he was not inferior to his rival in spirit or bravery, readily accepted the challenge; but after several messages concerning the arrangement of all the circumstances relative to the combat, accompanied with mutual reproaches bordering on the most indecent scurrility, all thoughts of this duel, more becoming the heroes of romance than the two greatest monarchs of their age, were entirely laid aside.

The example of two personages so illustrious, drew such general attention, and carried with it so much authority, that it had considerable influence in introducing an important change in manners all over Europe. Duels, as has already been observed, had been long permitted by the laws of all the European nations; and, forming a part of their jurisprudence, were authorized by the magistrate on many occasions, as the most proper method of terminating questions with regard to property, or of deciding in those which regarded crimes. But single combats being considered as solemn appeals to the omniscience and justice of the Supreme Being, they were allowed only in public causes, according to the prescription of law, and carried on in a judicial form*. Men, accustomed to this manner of decision in courts of justice, were naturally led to apply it to personal and private quarrels. Duels, which at first could be appointed by the civil judge alone, were fought without the interposition of his authority, and in cases to which the laws did not extend. The transaction between Charles and Francis strongly countenanced this practice. Upon every

Duel
Dugdale.

affront or injury which seemed to touch his honour, a gentleman thought himself intitled to draw his sword, and to call on his adversary to make reparation. Such an opinion, introduced among men of fierce courage, of high spirit, and of rude manners, where offence was often given, and revenge was always prompt, produced most fatal consequences. Much of the best blood in Christendom was shed; many useful lives were lost; and, at some periods, war itself hath hardly been more destructive than these contests of honour. So powerful, however, is the dominion of fashion, that neither the terror of penal laws, nor reverence for religion, have been able entirely to abolish a practice unknown among the ancients, and not justifiable by any principle of reason; though at the same time we must ascribe, in some degree, the extraordinary gentleness and complaisance of modern manners; and that respectful attention of one man to another, which at present render the social intercourse of life far more agreeable and decent than among the most civilized nations of antiquity.

Public opinion is not easily controlled by civil institutions; for which reason it may be questioned whether any regulations can be contrived of sufficient force to suppress or change the rule of honour which stigmatizes all scruples about duelling with the reproach of cowardice.

The inadequate redress which the law of the land affords for those injuries which chiefly affect a man in his sensibility and reputation, tempts many to redress themselves. Prosecutions for such offences, by the trifling damages that are recovered, serve only to make the sufferer more ridiculous.—This ought to be remedied.

For the army, where the point of honour is cultivated with exquisite attention and refinement, there might be established a court of honour, with a power of awarding those submissions and acknowledgments which it is generally the object of a challenge to obtain; and it might grow into a fashion with persons of rank of all professions to refer their quarrels to the same tribunal.

Duelling, as the law now stands, can seldom be overtaken by legal punishment. The challenge, appointment, and other previous circumstances, which indicate the intention with which the combatants met, being suppressed, nothing appears to a court of justice but the actual encounter; and if a person be slain when actually fighting with his adversary, the law deems his death nothing more than manslaughter.

DUERO, or DURO, a large river, which, rising in Old Castile in Spain, runs from east to west, crosses the province of Leon, and after dividing Portugal from Spain by a southerly course, turns westward, crosses Portugal, and falls into the Atlantic Ocean at Porto-Porto.

BUGDALE (Sir William), an eminent English historian, antiquarian, and herald, born in Warwickshire in 1605. He was introduced into the herald's office by Sir Christopher Hatton; and ascended gradually through all the degrees, until he became garter principal king at arms. His chief work is the *Monasticon Anglicanum*, in three vols folio; containing the charters and descriptions of all the English monasteries, adorned with engravings: in the former part of which

Duillia

Duke.

work he was assisted by Mr Roger Dodsworth. Nor are his Antiquities of Warwickshire less esteemed. He wrote likewise, among other things of less note, the History of St Paul's Cathedral; a History of Embanking and Draining; a Baroage of England; and completed the second volume of Sir Henry Spelman's Councils, with a second part of his Glossary. He died in 1636. His son, Sir John, was Norroy king at arms, and published a Catalogue of English Nobility. His daughter Elizabeth married the famous Elias Ashmole.

DUILLIA LEX, was enacted by M. Duillius, a tribune, in the year of Rome 304. It made it a capital crime to leave the Roman people without its tribunes, or to create any new magistrate without a sufficient cause. Another in 392, to regulate what interest ought to be paid for money lent.

C. DUILLIUS NEPOS, a Roman consul, the first who obtained a victory over the naval power of Carthage in the year of Rome 492. He took fifty of the enemy's ships, and was honoured with a naval triumph, the first that ever appeared at Rome. The senate rewarded his valour by permitting him to have music playing and torches lighted at the public expence every day while he was at supper. There were some medals struck in commemoration of this victory; and there exists a column at Rome which was erected on the occasion.

DUKE, DUX, a sovereign prince, without the title or quality of king. Such are the Duke of Lorraine, of Holstein, Savoy, of Parma, &c. The word is borrowed from the modern Greeks, who call *doucas* what the Latins call *dux*.

There are also two sovereigns who bear the title of *grand-duke*; as the *grand-duke* of Tuscany, and the *grand-duke* of Muscovy, now called the *czar* or emperor of Russia. The title of *great duke* belongs to the apparent heir of Russia; and the title of *arch-duke* is given to all the sons of the house of Austria, as that of *arch-dukeshi* to all the daughters.

DUKE, Dux, is also a title of honour or nobility, the next below princes.

The dukedom or dignity of duke is a Roman dignity, denominated *a ducendo*, "leading" or "commanding." Accordingly, the first dukes, *duces*, were the *duces exercituum*, "commanders of armies." Under the late emperors, the governors of provinces in war-time were intitled *duces*. In after times the same denomination was also given to the governors of provinces in time of peace. The first governor under the name of duke was a duke of the Marchia Rhetica, or Grisons, whereof mention is made in Cassiodorus; and there were afterwards thirteen dukes in the eastern empire, and twelve in the western. The Goths and Vandals, upon their over-running the provinces of the western empire, abolished the Roman dignities wherever they settled. But the Franks, &c. to please the Gauls, who had long been used to that form of government, made it a point of politics not to change any thing therein; and accordingly they divided all Gaul into duchies and counties; and gave the names sometimes of dukes, and sometimes of counts, *comites*, to the governors thereof.

In England, during the Saxons time, Camden observes, the officers and commanders of armies were called dukes, *duces*, after the ancient Roman manner,

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without any addition. After the Conqueror came in, the title lay dormant till the reign of Edward III. who created his son Edward, first called the *Black Prince*, duke of Cornwall; which hath ever since been the peculiar inheritance of the king's eldest son during the life of his father; so that he is *dux natus, non creatus*. After whom there were more made, in such manner as that their titles descended to their posterity. They were created with much solemnity, *per circuram gladii, cappeque, & circuli auri in capite impositionem*. However, in the reign of Queen Elizabeth, A. D. 1572, the whole-order became utterly extinct; but it was revived about 50 years afterwards by her successor, in the person of George Villiers duke of Buckingham.

Though the French retained the names and form of the ducal government, yet under their second race of kings there were scarce any such thing as dukes: but all the great lords were called counts, *peers*, or *barons*; excepting, however, the dukes of Burgundy and Aquitaine; and the duke of France, which was a dignity Hugh Capet himself held, corresponding to the modern dignity of *maire de palais*, or the king's lieutenant. By the weakness of the kings, the dukes or governors sometimes made themselves sovereigns of the provinces trusted to their administration. This change happened chiefly about the time of Hugh Capet; when the great lords began to dismember the kingdom, so that that prince found more competitors among them than subjects. It was even with a great deal of difficulty they could be brought to own him their superior, or to hold of him by faith and homage. By degrees, what with force, and what by marriages, these provinces, both duchies and counties, which had been rent from the crown, were again united to it. But the title *duke* was no longer given to the governors of provinces. From that time duke became a mere title of dignity, annexed to a person and his heirs male, without giving him any domain, territory, or jurisdiction over the place whereof he was duke. All the advantages thereof now consist in the name, and the precedence it gives.

The dukes of our days retain nothing of their ancient splendor but the coronet on their escutcheon, which is the only mark of their departed sovereignty. They are created by patent, circure of the sword, mantle of state, impolition of a cape, and coronet of gold on the head, and a verge of gold in their hand.

The eldest sons of dukes are by the courtesy of England styled *marquisses*, though they are usually distinguished by their father's second title, whether it be that of *marquis* or *earl*; and the younger sons *lords*, with the addition of their Christian name, as Lord James, Lord Thomas, &c. and they take place of viscounts, though not so privileged by the laws of the land.

A duke has the title of *grace*; and being writ to, he is styled, in the heralds language, *most high, potent, and noble prince*. Dukes of the blood royal are styled *most high, most mighty, and illustrious princes*.

DUKE, among Hebrew grammarians, is an appellation given to a species of accents answering to our comma. See ACCENT.

DUKE-Duke, a quality given in Spain to a grandee of the house of Sylva, on account of his having several duchies from the uniting of two considerable houses in his person. Don Roderigo de Sylva, eldest son of Don

Dulcifying
Dumbness.

Ruy Gomez de Sylva, and heir of his duchies and principalities, married the eldest daughter of the Duke de l'Infantado; in virtue of which marriage, the present Duke de Pastrana, who is descended therefrom, and is grandson of Don Roderigo de Sylva, has added to his other great titles that of duke-duke, to distinguish himself from the other dukes; some whereof may enjoy several duchies, but none so considerable ones, nor the titles of such eminent families.

DULCIFYING, in chemistry, is the sweetening any matter impregnated with salts, by frequently washing it in pure water.

DULL, in the manege. The marks of a dull horse, called by the French *marquis de ladre*, are white spots round the eye and on the tip of the nose, upon any general colour whatsoever. Though the vulgar take these spots for signs of stupidity, it is certain they are great marks of the goodness of a horse; and the horses that have them are very sensible and quick upon the spur.

DULLART (Heiman), a Dutch painter and poet. He was a pupil to Rembrandt, for whose works the few he left are often mistaken. He died in 1684.

DUMBARTON. See DUNBARTON.

DUMBNESS, the privation of the faculty of speech. The most general, or rather the sole cause of dumbness, is the want of the sense of hearing. The use of language is originally acquired by imitating articulate sounds. From this source of intelligence, deaf people are entirely excluded: they cannot acquire articulate sounds by the ear: unless, therefore, articulation be communicated to them by some other medium, these unhappy people must for ever be deprived of the use of language; and as language is the principal source of knowledge, whoever has the misfortune to want the sense of hearing, must remain in a state little superior to that of the brute creation. Deafness has in all ages been considered as such a total obstruction to speech or written language, that an attempt to teach the deaf to speak or read has been uniformly regarded as impracticable, till Dr Wallis and some others have of late shown, that although deaf people cannot learn to speak or read by the direction of the ear, there are other sources of imitation, by which the same effect may be produced. The organs of hearing and of speech have little or no connection. Persons deprived of the former generally possess the latter in such perfection, that nothing further is necessary, in order to make them articulate, than to teach them how to use these organs. This indeed is no easy task; but experience shows that it is practicable. Mr THOMAS BRAIDWOOD, late of Edinburgh, was perhaps the first who ever brought this surprising art to any degree of perfection. He began with a single pupil in 1764; and since that period has taught great numbers of people born deaf to speak distinctly; to read, to write, to understand figures, the principles of religion and morality, &c. At the time we first conversed with him, being a few years after the commencement of his practice, he had a considerable number of deaf pupils, some of them above 20 years of age, all making a rapid and amazing progress in those useful branches of education.

Mr Braidwood's principal difficulty, after he had
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discovered this art, was to make people believe in the practicability of it. He advertised in the public papers; he exhibited his pupils to many noblemen and gentlemen; till he found the generality of mankind unwilling to believe him. A remarkable instance of this incredulity occurred some years ago. A gentleman in England sent a deaf girl of his to Mr Braidwood's care. A year or two afterwards, Mr Braidwood wrote to the father, that his daughter could speak, read, and write distinctly. The father returned an answer, begging Mr Braidwood's excuse, as he could not believe it; however, he desired a friend of his, who was occasionally going to Edinburgh, to call at Mr Braidwood, and inquire into the truth of what he had wrote him: he did so; conversed with Mr Braidwood, saw the young lady, heard her read, speak, and answer any questions he put to her. On his return, he told the father the surprising progress his child had made; but still the father thought the whole an imposition: the girl herself wrote to her father, but he looked upon the letter as a forgery. About this time the father died; and the mother sent an uncle and cousin of the deaf lady's from Shrewsbury, in order to be satisfied of the truth. When they arrived, Mr Braidwood told the girl her uncle and cousin were in the parlour; and desired her to go and ask them how they did, and how her mother and other friends did. The friends were astonished, and could hardly credit their own ears and eyes.

When we conversed with Mr Braidwood concerning the nature and method of teaching this wonderful art, he seemed to be very desirous of communicating and transmitting his discovery to posterity; but observed, from the nature of the thing we believe it to be true, that he could not communicate it so fully in writing as to enable any other person to teach it. The first thing in the method is, to teach the pupil to pronounce the simple sounds of the vowels and consonants. We have even seen him performing this operation; but are unable to give a clear idea of it. He pronounces the sound of *a* slowly, pointing out the figure of the letter at the same time; makes his pupil observe the motion of his mouth and throat; he then puts his finger into the pupil's mouth, depresses or elevates the tongue, and makes him keep the parts in that position; then he lays hold of the outside of the windpipe, and gives it some kind of squeeze, which it is impossible to describe: all the while he is pronouncing *a*, the pupil is anxiously imitating him, but at first seems not to understand what he would have him to do. In this manner he proceeds, till the pupil has learned to pronounce the sounds of the letters. He goes on in the same manner to join a vowel and a consonant, till at length the pupil is enabled both to speak and read.

That his pupils were taught not only the mere pronunciation, but also to understand the meaning of what they read, was easily ascertained by a conversation with any of them. Of this Mr Pennant gives a remarkable instance in a young lady of about 13 years of age, who had been some time under the care of Mr Braidwood. "She readily apprehended (says he) all I said, and returned me answers with the utmost facility. She read; she wrote well. Her reading was not by rote. She could clothe the same thoughts in a new set of words,

Dumneſc. and never vary from the original ſenſe. I have forgot the book ſhe took up, or the ſentences ſhe made a new verſion of; but the effect was as follows:

“*Original paſſage.* Lord Bacon has divided the whole of human knowledge into hiſtory, poetry, and philoſophy; which are referred to the three powers of the mind, memory, imagination, and reaſon.

“*Verſion.* A nobleman has parted the total or all of man’s ſtudy or underſtanding into, An account of the life, manners, religion or cuſtoms of any people or country; verſe or metre; moral or natural knowledge: which are pointed to the three faculties of the ſoul or ſpirit; the faculty of remembering what is paſt, thought or conception, and right judgment.”

Mr Braidwood’s ſucceſs ſince he went to ſettle in London is univerſally known. Several other perſons have ſince attempted the ſame art with various degrees of ability. But a new and different method, equally laborious and ſucceſſful, we underſtand, is praſtiſed by the Abbé de l’Epee of Berlin. We are informed * that he begins his inſtructions not by endeavouring to form the organs of ſpeech to articulate ſounds, but by communicating ideas to the mind by means of ſigns and characters: to effect this, he writes the names of things; and, by a regular ſyſtem of ſigns, eſtabliſhes a connection between theſe words and the ideas to be excited by them. After he has thus furniſhed his pupils with ideas, and a medium of communication, he teaches them to articulate and pronounce, and renders them not only grammarians but logicians. In this manner he has enabled one of his pupils to deliver a Latin oration in public, and another to defend a theſis againſt the objections of one of his fellow pupils in a ſcholastic diſputation; in which the arguments of each were communicated to the other, but whether by ſigns or in writing is not ſaid; for it does not appear that the Abbé teaches his pupils to diſcern what is ſpoken, by obſerving the motion of the organs of ſpeech, which thoſe inſtructed by Meſſrs Braidwoods are able to do with aſtoniſhing readineſs.

There is perhaps no word, ſays the Abbé, more difficult to explain by ſigns than the verb *croire*, “to believe.” To do this, he writes the verb with its ſignifications in the following manner:

Je crois { *Je dis oui par l’eſprit, Je penſe que oui.*
Je dis oui par le cœur, J’aime à penſer que oui.
Je dis oui par la bouche.
Je ne vois pas des yeux.

After teaching theſe four ſignifications, which he does by as many ſigns, he connects them with the verb, and adds other ſigns to expreſs the number, perſon, tenſe, and mood, in which it is uſed. If to the four ſigns, correſponding with the lines above mentioned, be added that of a ſubſtantive, the pupil will write the word *ſoi*, “ſaith;” but, if a ſign, indicating a participle uſed ſubſtantively, be adjoined, he will expreſs *la croyance*, “belief;” to make him write *croiyable*, “credible;” the four ſigns of the verb muſt be accompanied with one that indicates an adjective terminating in *able*; all theſe ſigns are rapidly made, and immediately comprehended.

M. Linguet, a member of the Royal Academy, having aſſerted that perſons thus inſtructed could be conſidered as little more than automata, the Abbé invited him to be preſent at his leſſons, and expreſſed his

aſtoniſhment that M. Linguet ſhould be ſo prejudiced in favour of the medium by which he had received the firſt rudiments of knowledge, as to conclude that they could not be imparted by any other; deſiring him, at the ſame time, to reflect, that the connection between ideas and the articulate ſounds, by which they are excited in the mind, is not leſs arbitrary than that between theſe ideas and the written characters which are made to repreſent them to the eye. M. Linguet complied with the invitation; and the Abbé having deſired him to fix on ſome abſtract term which he would by ſigns communicate to his pupils, he choſe the word *unintelligibility*; which, to his aſtoniſhment, was almoſt inſtantly written by one of them. The Abbé informed him, that to communicate this word he had uſed five ſigns, which, though ſcarcely perceivable to him, were immediately and diſtinctly apprehended by his ſcholars: the firſt of theſe ſigns indicated an internal action; the ſecond repreſented the act of a mind that reads internally, or, in other words, comprehends what is propoſed to it; a third ſignified that ſuch a diſpoſition is poſſible; theſe, taken together, form the word *intelligible*; a fourth ſign transforms the adjective into the ſubſtantive; and a fifth, expreſſing negation, completes the word required. M. Linguet afterwards propoſed this queſtion, *What do you underſtand by metaphyſical ideas?* which being committed to writing, a young lady immediately answered on paper in the following terms: “I underſtand the ideas of things which are independent of our ſenſes, which are beyond the reach of our ſenſes, which make no impreſſion on our ſenſes, which cannot be perceived by our ſenſes.” On reading this, we cannot help exclaiming with the poet, *Labor omnia vincit improbus!* a maxim by none more forcibly illuſtrated than by the Abbé de l’Epee.

Periodical DUMNEſS. In the Ephemerides of the Curious, we have an account of a periodical dumneſs, which had continued for more than 15 years, and had not gone off at the time the account was wrote. The perſon was ſon to an inn-keeper at Jeſing in the duchy of Wirtemberg in Germany. He was one night taken ſo ill after ſupper, that he could neither ſtand nor ſit. He continued, for about an hour, oppreſſed with ſickneſs to ſuch a degree as to be in danger of ſuffocation. At the expiration of this time he grew better; but, during three months, he was much dejected, melancholy, and, at times, fearful. He was then ſuddenly ſtruck dumb, and became unable to pronounce the leaſt word, or form the leaſt ſound, though he could ſpeak very articulately before. The loſs of ſpeech was at firſt inſtantaneous, and continued only a few minutes: but the duration of it began to lengthen every day; ſo that it ſoon amounted to half an hour, two hours, three hours, and at laſt to 23 hours, yet without any order. At laſt the return of ſpeech kept ſo conſtant and regular an order, that, for 14 years together, he could not ſpeak except from noon, during the ſpace of one entire hour, to the precise moment of one o’clock. Every time he loſt his ſpeech, he felt ſomething riſe from his ſtomach to his throat. Excepting this loſs of ſpeech, he was afflicted with no other diſorder of any animal function. Both his internal and external ſenſes continued found: he heard always perfectly well, and answered the queſtions propoſed to him by geſtures or writing.

* *Novo.*
Mém de
l’Académie
Royale, &c.
de Berlin,
1785.
[Mém. Rev.
vol. lxxx.
p. 651.]

Dumfries-ling. writing. All suspicion of deceit was removed by his keeping exactly the same hour, though he had no access to any instruments by which time can be measured.

DUMFERMLINE, a parliament-town of Scotland, situated in the county of Fife, 15 miles north-west of Edinburgh: W. Long. 30. 20. N. Lat. 56. 15. Here was formerly a magnificent abbey and palace of the kings of Scotland, in which the princefs Elizabeth, daughter of king James VI. and mother of the princefs Sophia, from whom the present royal family are descended, was born. In the inn of this town is the marriage bed of James VI. and his queen; it is still entire, and used by strangers who lodge here. This place is noted for a manufactory of figured linen cloth called Diaper. The town gave title of earl to a baronet of the Seton family, which was forfeited in the year 1690.

DUMFRIES, a county in the south of Scotland, comprehending the shire of Nithdale, the stewartry of Annandale, and the lordship of Eskdale, extends in length from north-west to south-east about 60 miles, and is about 30 miles in breadth where broadest. It is bounded on the south-west by Galloway and part of Kyle; on the north-east by the counties of Roxburgh, Selkirk, and Peebles; on the north-west by Clydesdale; and on the south-east by Solway Frith and the marches between Scotland and England. A great part of the country is mountainous and overpread with heath, well stocked with game of all kinds: but the valleys, through which the Elke, the Annan, the Nith, and other smaller rivers run, are extremely pleasant; and some of them well cultivated and very fertile, and produce oats, barley, and wheat in abundance, both for maintaining the inhabitants and for exportation; while the mountainous parts afford pasture for innumerable flocks of sheep and herds of black cattle, many thousands of which are annually exported to England. In the valleys are several natural woods and some extensive plantations of different kinds of timber. In the division called *Nithdale*, are the rich lead mines of Wanlockhead, the coal mines of Sanguilar and Cairn-burn, the inexhaustible lime-quarries of Clofeburn and Barjarg, and free stone in almost every parish. Annandale has the rich lime-quarries of Kellhead and Comtongan, with plenty of free stone near the towns of Annan and Lochmaben: and in the lower part of Eskdale are lime stone and coal in abundance.

DUMFRIES, the capital of the above mentioned county, a handsome town, situated on a ridge or rising ground on the north-east side of the river Nith, about 10 miles above where it falls into Solway Frith, in N. Lat. 55. 8. 30. Long. W. of Greenwich Observatory, 3. 56. Its ancient name, it is said by some of the Scotch historians, was *Cotiac*; but on what authority we cannot tell. Its present name appears to have been derived partly from its situation, and partly from the monastery of Grey Friars that formerly stood near the head of the street called the *Friar-vennial*, the kitchen of which is all that now remains; being only a corruption of *Drum friars*, or "the eminence of the friary;" and accordingly, till within these 40 or 50 years, it was always spelt *Drumfries*, and not *Dumfries*, as it is now for the sake of greater softness. Besides the pleasantness of its situation on the side of a beautiful winding river, it is surrounded on all sides with one of the

finest and best cultivated sheets of dale country that one can any where meet with, and the prospect from it terminated at the distance of a few miles, by a continued chain of hills, forming altogether one of the grandest natural amphitheatres perhaps in Britain. There was anciently a strong castle at the south end of the town belonging to the Cummings, lords of Badenoch, of which there are now no remains. Another castle was afterwards built at the north-west end, which was taken down about 70 years ago. On the north-east side of it, at some little distance, are the ruins of a chapel built by K. Robert Bruce, and endowed for a number of priests to say mass for the repose of the soul of Sir Christopher Seaton his brother-in-law, who was taken prisoner by Edward I. at Loch-Urr, and hanged at this place. It is now only employed as a burying place for suicides. It is not certain at what period Dumfries was erected into a royal borough; but it must have been before the middle of the eleventh century, as a grave-stone was discovered some time ago bearing the date of 1079, and mentioning the person buried under it to have been a merchant and burghs of the town: and that it was a place of consequence in the beginning of the fourteenth century, is evident from this circumstance, that Edward II. called the estates of Scotland to meet there in the year 1307. In the above mentioned monastery too, K. Robert Bruce killed his rival Cumming lord of Badenoch, with the assistance of James Lindsay and Roger Kirkpatrick, on the 5th of February 1305. As to the present state of the town, the houses are well built and commodious, the streets spacious, open, and neatly paved. It has two very elegant churches, an episcopal chapel with a fine little organ, besides three meeting-houses belonging to different descriptions of sectaries; a tolbooth; a council-chamber; a trades hall; a meal-market; a strong prison; a correction-house; a large hospital; an infirmary, with apartments for insane patients; a narrow bridge of 9 arches over the river, said to have been built by one of the three daughters and co-heiresses of Alan lord Galloway. A large village, called the *Bridge-end*, stands on the opposite side, and is within the stewartry of Kirkcudbright. The assizes for the county, and for the shire of Galloway and stewartry of Kirkcudbright, are held in the town twice a year. It is also the place for holding the sheriff and commissary courts, the quarter-sessions of the peace, and the courts of the commissioners of supply. It is governed by a provost, three bailies, a dean of guild, and a town-council, composed of merchants and the convener and deacons of the incorporated trades; of which there are seven, viz. square-men, smiths, weavers, tailors, shoemakers, skinner, and butchers; all of whom are chosen into their respective offices at Michaelmas annually. The trades got from king James VI. in one of his journeys to England, a small silver tube, like a pistol barrel, called the *fleece gun*, with his royal licence to shoot for it every year. At that festival they all appear in arms, and march out of the town under their respective colours, to some convenient place, where they shoot at a mark; and the person that hits or shoots nearest to it, returns to town, marching at the convener's right hand, with the silver gun tied to his hat with ribbons; after which they conclude the day with a social entertainment. The town has a

Dumont
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Dun.

weekly market on Wednesday, with two annual fairs, the first on the Wednesday on or next after the 13th of February, and the other on the Wednesday on or next after the 25th of September. At these fairs vast numbers of horses and black cattle are sold; and no town in Scotland is better provided with all sorts of butcher-meat in their season. But though well situated for fuel at a cheap rate, it has only two manufactures, one for stockings and the other for cottons; but the latter only in its infancy. Its foreign trade for many years has only consisted in timber, iron, and other articles for home consumption. It gives the title of Earl to the chief of the family of Crichton; and is the seat of a presbytery and provincial synod. It contains about 6000 inhabitants.

DUMONT (Francis), a Frenchman; compiler of a general collection of treaties of commerce, alliance, and peace, between the powers of Europe. This collection, with Barbeyrac's, containing the treaties B. C. makes 16 vols folio, very useful for historical writers. Dumont retired to Holland in 1720. The time of his death is uncertain.

DUMOSÆ (from *dumus*, a bush), an order of plants in the *Fragmenta methodi naturalis* of Linnæus, containing the following genera, viz. *Viburnum*, *Timus*, *Opulus*, *Sambucus*, *Rondeletia*, *Bellonia*, *Cassine*, *Ilex*, *Tomax*, &c.

Plac
CLXV.

DUN, or BURGH, the name of an ancient species of buildings, of a circular form, common in the Orkney and Shetland islands, the Hebrides, and northern parts of Scotland. The latter term points out the founders, who at the same time bestowed on them their natal name of *borg*, "a defence or castle," a Sæco-Gothic word; and the Highlanders universally apply to these places the Celtic name *dun*, signifying a hill defended by a tower, which plainly points out their use. They are confined to the countries once subject to the crown of Norway. With few exceptions, they are built within sight of the sea, and one or more within sight of the other; so that on a signal by fire, by flag, or by trumpet, they could give notice of approaching danger, and yield a mutual succour. In the Shetland and Orkney islands, they are most frequently called *swart* or *wardhills*, which shows that they were garri-soned. They had their wardmather, or watchman, a sort of centinel, who stood on the top, and challenged all who came in sight. The gackman was an officer of the same kind, who not only was on the watch against surprize, but was to give notice if he saw any ships in distress. He was allowed a large horn of generous liquor, which he had always by him, to keep up his spirits. Along the Orkney and Shetland shores, they almost form a chain; and by that means not only kept the natives in subjection, but were situated commodiously for covering the landing of their countrymen, who were perpetually roving on piratical expeditions. These towers were even made use of as state-prisons; for we learn from Torfæus, that after Sueno had surprized Paul, count of Cathness, he carried him into Sutherland, and confined him there in a Norwegian tower. Out of our own kingdom, no buildings similar to these are to be found, except in Scandinavia. On the mountain Swalberg in Norway is one; the Stir-biskop, at Upfal in Sweden, is another; and Umfæborg, in the same kingdom, is a third.

Dunbar,
Dunbarton.

These towers vary in their inner structure; but externally are universally the same; yet some have an addition of strength on the outside. The burgh of Culwick in Shetland, notwithstanding it is built on the top of a hill, is surrounded with a dry ditch 13 feet broad; that of Snaburgh in Unst, has both a wet and a dry ditch; the first cut, with great labour, through the live rock. The burgh of Moura is surrounded by a wall, now reduced to a heap of stones, and the inside is cylindrical, not taper, as usual with others. The burgh of Hogseter, upon an isle in a loch of the same name, has also its addition of a wall; a peculiarity in a caufeway, to join it to the main land, and a singular internal structure. Numbers of little burghs, with single cells, are scattered about these islands, in the neighbourhood of the greater; and which probably were built by the poorer sort of people, in order to enjoy their protection. A multitude of places in these islands have the addition of burgh to their names, notwithstanding there is not a vestige of a tower near them; the materials having long since been carried away, and applied to various uses.

DUNBAR, a parliament town of Scotland, in the shire of Mid-Lothian, once remarkable for a strong castle, the key of Scotland from the east, and which gave shelter to Edward II. of England in his flight from Bannockburn, but of which scarce a vestige now remains. Here are still preserved some of the Scottish pikes, six ells long, and formed for both offence and defence. This town has now a tolerable trade in the fisheries, and is remarkable for making good malt. Dunbar has given titles of honour to different families, who are all now extinct.

DUNBARTON, the chief town of Lenox or Dunbarton shire in Scotland, situated in W. Long. 4. 32. N. Lat. 56. 30. It is remarkable for nothing but its castle. This is a steep rock, rising up in two points, and every where inaccessible, except by a very narrow passage or entry, fortified with a strong wall or rampart. Within this wall is the guard-house, with lodgings for the officers; and from hence a long flight of stone-steps ascends to the upper part of the castle, where there are several batteries mounted with cannon, the wall being continued almost round the rock. In the middle of this upper part where the rock divides, there are commodious barracks with a deep well, in which there is always plenty of water. Here likewise are the remains of a gateway and prodigious high wall, at the top of which there was a wooden bridge of communication from one rock to another. This gateway was sometimes blocked up during the intestine commotions of Scotland, so that garrisons of different factions possessed different parts of the castle, and each had a gate towards the water. The castle stands in the angle formed at the conflux of the Clyde and Leven; so that it is wholly surrounded by water, except a narrow isthmus, and even this is overflowed at every spring-tide: nor is there any hill or eminence within a Scots mile of this fortress. It commands the navigation of the Clyde; and, being deemed the key of the western Highlands, is kept in some repair, and garrisoned with invalids, under the command of a governor and some subordinate officers. The government of it is worth 7000 l. a year.—Dunbarton is a royal borough; and formerly

merly gave title of Earl to a branch of the family of Douglases.

DUNCANNON, a fort in the county of Wexford, and province of Leinster, in Ireland, seated on the river Rofs. It commands the river, inasmuch that no ship can pass to Waterford or Rofs without its permission. Here are barracks for three companies of foot. W. Long. 6. 30. N. Lat. 52. 10.

DUNCARDS, **DUNKERS**, or *Tunkers*. See **TUNKERS**.

DUNCOMBE (William), younger son of John Duncombe, Esq; of Stocks in Hertfordshire, in 1722 published a translation of Racine's *Athalieh*; which was well received by the public, and has gone through three editions. In 1724 he was editor of the works of Mr Needler; in 1735, of the poems of his deceased brother-in-law, Mr Hughes, 2 vols 12mo; in 1737, of the miscellanies of his younger brother Mr Jabez Hughes, for the benefit of his widow, in one volume 8vo; and in 1745, of the works of the Rev. Mr Samuel Say, in one volume 4to. In 1726 he married the only sister of John Hughes, Esq; whom he long survived. In 1734 his tragedy of *Lucius Junius Brutus* was acted at Drury-Lane Theatre. It was published in 1735, and again in 1747. The works of Horace, in English verse, by several hands, were published by him in two vols 8vo, with notes, &c. in 1757. A second edition, in four vols 12mo, with many imitations, was published in 1762. In 1763 he collected and republished "Seven sermons by archbishop Herring, on public occasions, with a biographical preface." He died Feb. 26. 1769, aged 80.

DUNDALK, a town of Ireland, in the county of Louth, about 40 miles from Dublin. It is a large, ancient, and thriving town, with a wide street, near a mile long, and a very fine market-house, near the entrance from Dublin. In the reign of Edward II. it was a royal city, and the last we read of where a monarch of all Ireland was actually crowned and resided. It was formerly very strong, and had many towers and small castles in it. It is very advantageously situated for a most extensive inland trade, and the port is very safe for shipping. The bay has good moorings at all times, in four to upwards of eight fathoms water, with very good land-marks, either for bringing up to, or making the harbour; and in crossing the bar at high water, or ordinary neap tides, there is from 15 to 18 feet water. The only cambric manufacture in Ireland is carried on in this town.

DUNDEE, a parliament town of Scotland, in the shire of Forfar or Angus, is seated on the north side of the river Tay, about 12 measured miles from its mouth, 40 measured miles north of Edinburgh, and 22 east from Perth, in W. Long. 2. 48. N. Lat. 56. 26. Its situation for commerce is very advantageous. Trading vessels of the largest burden can get into the harbour; and on the quay there are three very convenient and handsome warehouses built in 1756, as well as good room for shipbuilding, which is carried on to a large extent. The houses are built of stone, generally three and four stories high. The market-place or high street in the middle of the town is a very spacious oblong square, 360 feet long and 100 feet broad; from whence branch out the four principal streets, which with a number of lesser ones are all paved

in the best manner. On the south side of the market-place stands the town-house; an elegant structure, with a very handsome front, piazzas below, and a neat spire over it 140 feet high. This building was finished in the year 1734, and contains the guild-hall, the court-room, a very neat mason-lodge, the bank, vaulted repositories for the records, and the common prison, which is in the upper story, and does honour to the taste and humanity of the magistrates, under whose auspices it was constructed, being well aired commodious rooms, at the same time very strong and secure. Each prison is 20 feet by 12, and 7½ feet high, well arched above and below.

The meal-market and shambles, which were formerly on the high street, and esteemed a nuisance, were removed some years ago; and in the place of the shambles, there is now erected by the incorporated trades, on the east end of the above large square, a grand building, with a large and elegant cupola: in the ground-floor of which is a very neat coffee-room, and several merchant shops; and in the upper stories public rooms for each trade, and a common hall occasionally used as a theatre. This hall is 50 feet long, 30 feet broad, and 25 feet high; having its front to the square decorated with Ionic columns.

The opulence of the corporations, nine in number, may be inferred from this, that they had, along with the kirk-session, but very lately finished a most elegant church when they set about building the hall. This church, which is called *St Andrew's Church*, stands on a rising ground a little north from the Cowgate street; and has an elegant spire 130 feet high, with a peal of bells much admired. There is a neat entry to the church by a broad gravel walk, with grass plots on every side; and the whole policies around it are laid out with excellent taste, and in a superb stile, as complete and well executed as any in Scotland.

Dundee, beside St Andrew's church, has four other churches, and five ministers on the legal establishment. The old church, in which were originally four places of worship, when entire, had been a very magnificent building, with a large square Gothic tower or steeple 186 feet high, on the west end of the church. This building was in the form of a cross, erected by David Earl of Huntingdon, brother to William I. of Scotland (furnamed the Lion), and was dedicated to the Virgin Mary. This he did on his return from the third crusade (in which with 500 of his countrymen he had accompanied Richard I. of England) anno 1189, in gratitude for his deliverance from several imminent dangers, and particularly from shipwreck, by which he had nearly perished when in sight of this town. At the same time he changed the name of the town from *Alledum* to *Dei Donnun*, whence its present name is thought by many to be derived; while others maintain that its name was *Duntay*, or "the Hill of Tay." The word *Alledum* in the Gaelic signifies "beautiful," and harmonizes very well with the scripture sense of the Hill of God. The word *Duntay* has the very same signification, "the Hill of God;" and both agree with the delightful situation of Dundee, and unite in giving it with propriety the name of *Bonny Dundee*. The hill rises on the north of the town to a great height, and is called *The Lazo of Dundee*; *lazo* being a Saxon word for a round hill such as it is. On its top,

Dundee. top there are evidently the remains of a camp, said to have been first erected by Edward I. of England, and lastly repaired by General Monk. Where the meal-market flood is now erected an elegant Episcopal meeting-house, with handsome shops below.

Dundee had an old castle which was demolished by the famous Scots governor Sir William Wallace, who was educated in this town. The castle had proved very useful to Edward I. when he put a garrison into it to awe the inhabitants; but Wallace getting possession, ordered it to be destroyed, lest it should again fall into the hands of the English. This treatment so exasperated Edward, that, taking the town by storm, he set fire to the churches; and a number of the inhabitants having taken sanctuary there with their most valuable effects, were all burnt along with them. At that time he burnt also a great part of the town. The desolation he brought on the church has continued ever since, till the year 1787, when a noble edifice began to be built on the site of the one that was burnt down, and is now finishing; in which the ancient Gothic of the outside is excellently united with internal modern architecture, making one of the largest and neatest churches in the kingdom, and again completing the superb superstructure as erected at the first by the Earl of Huntingdon.

This town suffered greatly last century during the troubles of Charles II. and the usurpation of Oliver Cromwell; being sometimes under the command of one party, and at others in the mercy of another. In 1645 the Marquis of Montrose took it by storm; and in 1651, under the command of its provost Major General Lumden, it vigorously opposed General Monk, who carried it by storm the first of September, and put all in arms to the sword. And so great were the riches of Dundee, all the neighbouring gentlemen having retired to it with their best effects as a place of safety, that every private foldier in General Monk's army had near 60 l. Sterling to his share of the plunder; there being above 60 merchant vessels in the harbour at that time, and the like number of vessels sailed for England loaded with the spoils of the unfortunate inhabitants. By these and other invasions, the whole ancient records of the town were destroyed, except a deed of Queen Mary, signed by herself, conferring the present burying ground; and some charters of the Charles's, confirming the ancient rights and privileges as disposed by the Alexanders and others kings of Scotland. This burying-ground is the only place in Scotland we know of called *The Hoff*, a Dutch word bearing all the senses of the English word *court*, having been formerly the burying-ground of one of the many religious houses that were in this town previous to the Reformation.

Dundee at present has 113 vessels belonging to the port, of above 8200 tons burden, and near 1000 seamen. Of these vessels four went last season to Greenland, a trade of long standing here. And beside the three public warehouses on the shore, there are above twenty large private warehouses belonging to the merchants. The magistrates have been lately and still are at great expence in enlarging and fitting up the harbour, so as to render it of easy access, safe, and commodious; and have now made the passage over the Tay, where there is a great resort, so convenient, that travellers

with their horses can get over at any time of tide, and a sufficient number of good boats properly manned are always ready. The river Tay opposite Dundee is about three miles broad; and being sheltered by high lands on both sides, is a safe road for ships of the greatest burden: the piers are extensive, broad, and well adapted for the purposes of loading and discharging vessels; and when the harbour is completed in the plan they are presently engaged in, there will not be one superior to it in Scotland.

To enable the town to repair the damage done by Cromwell's army, and also their harbour and other public works, Charles II. granted them a small impost of one-sixth of a penny Sterling, for 25 years, on the pint of ale brewed or brought into the town for sale; which grant has been frequently renewed by subsequent parliaments; and the fund arising therefrom is most properly bestowed by the magistrates in improving the town, and making it more convenient and healthy. For these purposes, several new streets have been made, the old ones have been widened, and a large convenient one at a considerable expence carried down from the market-place to join a fine walk, shaded very neatly with trees, that leads to the shore. This new street makes the access easy and commodious, which was formerly much confined and steep.

Till the year 1745, the town had only draw-wells; but since that period it is most amply supplied from a large fine fountain of excellent water, conveyed through the town in lead pipes, and discharged by good wells at proper distances. These, with a fine well in the town's meadows, and a stream of water that runs thro' the ward and the meadows (two large beautiful greens on the north of the town), make it as well watered as any town in Scotland; and these greens, just at hand, serve all the inhabitants most commodiously for the necessary labours of washing and bleaching.

The number of inhabitants in Dundee have increased above 4000 since 1780. There was then an accurate list of them taken, when they amounted to near 16,000; and lately they were reckoned and found within a few of 20,000; and since the year 1760 they are fully doubled. Beside the established churches, there are three Episcopal meeting-houses, two of Seceders, one of Methodists, two of Independents, one Berean, and two Anabaptists. One of the Independents is of the Glasite denomination. Mr John Glas, from whom they take that name, resided here; and his principles, though spread far and wide, have always had the greatest following in Dundee.

The trade in the town has increased amazingly of late. Its staple is undoubtedly the linen manufacture: for which in summer 1788 they imported from the Baltic 32 cargoes of flax, hemp, &c. near 3000 tons, beside several quantities from London, Leith, and other places; and on an average the brown linen stamped for the two preceding seasons at the stamp-office here amounted to about four millions of yards, in value about 115,000 l. Sterling. The flax is wrought up into coarse linens, chiefly Osna-burgs, sheetings, foldiers shirts, &c. which is sold partly bleached (several fine large bleachfields being well employed in the neighbourhood) and partly brown. These linens are sent principally to London, Glasgow, and Liverpool, and from thence exported. Seven or eight

Dundee
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eight vessels are constantly employed in the trade between Dundee and London, one of which sails every ten or twelve days. The making fail-cloth has been long established here, and is carried on to a good extent. Two rope-works have succeeded well, and a buckram-work has also been established for several years. The Dundee coloured threads have been long justly esteemed, and give bread to a great number of people; indeed it was here that coloured threads first made a figure among the articles of trade in Scotland. Their sugar-house, a large undertaking, and tan-works, are of established reputation. There has been lately erected a large glass-work at a great expence, and a plumbery and foundery are also now carried on to advantage. No doubt the trade of the place has been greatly promoted by the Bank; which is carried forward on the surest and most steady footing, and has always managed the business of the town and neighbourhood in such a way as to keep any other establishment of that kind from taking place. Of late the cotton manufactory has been introduced; a number of jennies being employed in spinning, and several looms in weaving it. A large machine for spinning shorts or hackens into candlewicks, the first of the kind in Scotland, is also begun to work here, and promises to do well. A spirit for literature and education has greatly prevailed of late years in Dundee: for beside the public grammar-school, which has an able rector and two good masters; the public English and writing school, where are three very proper masters; there is also lately established, and much encouraged, an academy for mathematics, French, Italian, and the polite arts, with masters suitable for the different branches, and a large apparatus for natural philosophy.

The salmon fishing in Tay is of much consequence; and the town is generally well supplied with fish of various kinds, though like every other article of living much raised in price of late years. Their other markets are also well supplied. An excellent nursery at the west end of the town has been much encouraged; and its neighbourhood is now adorned with many neat and elegant villas, showing the wealth and taste of the inhabitants.

Dundee is the birth-place of the celebrated and learned Hector Boethius, whose History of Scotland has been long in much reputation with many. It, with Perth, Forfar, St Andrew's, and Cupar, returns one member to the British parliament.

DUNFERMLINE. See DUMFERMLINE.

DUNG, in husbandry. See AGRICULTURE, n^o 20.

DUNG-BIRD. See URUPA.

DUNG MEERS, in husbandry, places where soils and dungs are mixed and digested together. These consist of pits, prepared at the bottom with stone and clay, that they may hold water, or the moisture of the dung; and ought to be so situated, that the sinks and drips of the houses and barns may run into them. Into these pits they cast refuse, fodder, litter, dung, weeds, &c. where they lie and rot together, till the farmer have occasion for them.

DUNG WORMS, a species of fly-worms, of a short and somewhat flat body, found in great plenty among cow-dung in the months of September and October.

DUNGANNON, the chief town of the county of

Tyrone, in the province of Ulster in Ireland. It is situated on a hill, and is a place of some strength.

DUNGARVON, a town of Ireland, in the county of Waterford. It stands on a bay of the same name, has a commodious harbour for ships, and is a walled town with a castle. W. Long. 7. 55. N. Lat. 51. 57.

DUNIPACE. See the article CARROON.

DUNKELD, a town of Scotland, in the shire of Perth, seated on the north side of the river Tay, in a situation truly romantic, under and among very high and almost inaccessible craggs, part naked and part wooded. It is the chief market town of the Highlands, and has been greatly improved with buildings by the Dukes of Athol.

The place is of great antiquity. It was the capital of ancient Caledonia. About the dawn of Christianity, a Pictish king made it the seat of religion, by erecting a monastery of Culdees there; which King David I. in 1130 converted into a cathedral, and it ranked as the first in Scotland. The entire shell of the cathedral still remains, the east end serving for a kirk, on the north side of which is the burial place of the Dukes of Athol. The style of architecture is simple and elegant, the pillars round. The monument of one of its bishops remains in the fourth aisle of the nave, as also that of Alexander Stuart Earl of Buchan, third son of Robert II. called for his cruelty *The Wolf of Badenoch*, who died 1394. The tower at the west end, with a singular crack down one of its sides, adds to the picturesque appearance which the whole makes among the venerable pines at the end of the Duke's garden. His Grace's seat is a modern building, and not large, with pleasant walks and policies, and a fine cascade on the water of Bran, which in its way from the western hills forms an astonishing fall of 150 feet, called the *Rumbling Brig*, from a narrow bridge made by the fall of two rocks across the stream. The pencil of Rofa never formed a more horrid scene. The stream has a second fall, which, without seeing the other, would be deemed capital. Sir James Galloway, master of requests to James VI. and Charles I. was created Lord Dunkeld 1645, whose grandson James was attainted at the Revolution, and dying at the beginning of this century, the title became extinct.

DUNKERS, DUNCARDS, or *Tunkers*. See TUNKERS.

DUNKIRK, a maritime town of the French Netherlands, situated in E. Long. 2. 28. N. Lat. 51. 10. and is the most easterly harbour on the side of France which is next to Great Britain.—It was originally a mean hamlet, consisting only of a few fishermen's huts; but a church being built there, it was from that, and from its situation, which is a sandy eminence, called *Dunkirk*; *dun* signifying, in the old Gallic language, a hill; and *kirk* being the old Flemish name for church.

About the year 960, Baldwin Earl of Flanders, thinking the situation convenient, enlarged it into a kind of town, and surrounded it with a wall. In the year 1322, Robert of Flanders, who held it as an appendage, built a castle for its defence; which was afterwards demolished by the revolvers of Flanders. Robert of Bar erected a fortification round it, the remains of which are visible on the side next the harbour. The emperor Charles V. who held it as part of Flanders, built

Dungarvon
Dunkirk.

Dunkirk. built another castle to defend the harbour; but this was also demolished soon afterwards. In 1558, the French, under Marfhal de Thermes, took Dunkirk by storm, and almost ruined the place; the Spaniards recovered it again in about a fortnight, and put all the French to the sword.

During a peace procured for the Dunkirkers by Philip II. of Spain, they rebuilt their town with greater splendor than before, and the inhabitants for a long time subsisted by privateers fitted out against the Dutch; and at length, growing rich by these hostilities, they fortified their town and harbour, and fitted out no less than 15 ships of war at their own charge.

In 1634, the Dunkirkers agreed with the inhabitants of Bergues to dig a canal, at their joint expence, for a communication between the two towns; which was some time afterwards effected. By this time, Dunkirk was become the best harbour the Spaniards possessed in Flanders, which induced many foreigners to settle there; and it being necessary to enlarge the town for their accommodation, a new fortified wall was built at a considerable distance from the former. In 1646, it was besieged and taken by the prince of Condé. In 1652 it was retaken by the archduke Leopold, then governor of the Netherlands. France entering into a treaty with England in 1653, the Dunkirkers, with views of pecuniary advantage, fitted out privateers against both those powers: the consequence of which was, that the French, assisted by Cromwell, attacked and took it; and it was put into the hands of the English, in consequence of a treaty between them and the French. To the English it was even then of very great importance; for, during the war in which it was taken, the Dunkirkers had made prizes of no less than 250 of their ships, many of which were of great value. They therefore improved the fortifications, and built a citadel: yet they kept it only four years; for in 1662, two years after the restoration, Charles II. sold this valuable acquisition to France, for the paltry sum of 500,000*l.* In consequence of this sale, the town was taken possession of for the French king Louis XIV. by the count d'Estrades, on the 29th of November 1662. Louis having acquainted the celebrated engineer Monsieur Vauban, that he intended to make Dunkirk one of the strongest places in Europe, Vauban drew up a plan with that view, which was gradually executed. An arsenal was erected, large enough to contain all the stores necessary for fitting out and maintaining a large fleet of men of war; the fortifications on the land-side were constructed in a manner that was thought to render them impregnable; and towards the sea, the entrance of the harbour being properly formed, it was fortified by the jetties, and the two forts called *Green Fort* and the *Fort of Good Hope* at their extremities; the famous *Risbank* was also erected on one side of the jetties, and *Fort Calliard* on the other, to secure the town. These works were all completed in 1683; and in 1685, the whole circumference of the bastion was faced with masonry, and the keys completely formed: at the same time care was taken to build at the entrance of this bastion a sluice, almost 45 feet wide, that the ships within might be constantly afloat. In 1689, the fort called the *Cornichon*, and some other works, were completed. But though 30 years had been now employed in improving the fortifications of Dunkirk, it was not yet in the state

in which Louis intended to put it; and therefore, in 1701, he caused a new risbank to be built, called *Fort Blanc*. **Dunkirk.**

At the treaty of Utrecht, it having been made appear, that the privateers of Dunkirk had, during the war then closing, taken from the English no less than 1614 prizes, valued at 1,334,375*l.* Sterling, it was stipulated, that the fortifications of the city and port of Dunkirk should be entirely demolished, and the harbour filled up, so as never to be an harbour again.

The treaty, of which this demolition of Dunkirk was an article, was signed on the 28th of April 1713; but the demolition did not take place till the September following, when the queen deputed colonel Armstrong and colonel Clayton to oversee the execution of the treaty as far as concerned the works and harbour of Dunkirk.

Under the inspection of these gentlemen, the places of arms were broken down, the ditches filled up, and the demi-lunes, bastions, and covered way, totally destroyed; the citadel was razed, and the harbour and bastion filled up; the jetties were also levelled with the strand, and all the forts which defended the entrance into the harbour were demolished. A large dam, or bar, was also built across the mouth of the harbour between the jetties and the town, by which all communication between the harbour and the canal, which formed its entrance, was entirely cut off. The sluices were also broken up, and the materials of them broken to pieces.

But this was no sooner done, than Louis XIV. ordered 30,000 men to work incessantly upon a new canal, the canal of Mardick, which in a short time they accomplished; by which the harbour was rendered almost as commodious as ever: but in 1717 this likewise was rendered unserviceable.

In the year 1720, during a great storm, the sea broke up the bar or dam, and restored to the Dunkirkers the use of the harbour in a very considerable degree.

In the year 1740, when Great Britain was engaged in a war with Spain, Louis XV. set out about improving the advantage which Dunkirk had derived from the storm in 1720, by restoring the works, and repairing the harbour. He rebuilt the jetties and erected new forts in the place of those which had been destroyed; and soon afterwards he espoused the cause of Spain, and became a principal in the war against us.

But at the peace of Aix-la-Chapelle in 1748, it was stipulated, that all the works towards the sea should be destroyed a second time; yet, before the declaration of the last war, the place was in as good a state of defence towards the sea as it was at any time during the war which was concluded by the treaty of Aix-la-Chapelle.

DUNSE, a market-town of Scotland, in the shire of Mers, situated in W. Long. 2. 15. N. Lat. 55. 42. It is seated on a rising ground in the middle of the shire, and has a weekly market for cattle. It is by some reputed the birth-place of the famous John Duns Scotus.—A mile south of the town is a well of mineral water, of great use as a deobstruent and antiscorbutic, first discovered in 1747 by Dr Thomas Simpson who practised there.

Duns.

DUNS SCOTUS (John), a Franciscan friar, commonly called *Doctor Subtilis*, was born in the year 1274; but whether in England, Scotland, or Ireland, hath long been a matter of dispute among the learned of each nation. Dempster, Mackenzie, and other Scottish writers, assert positively that he was born at Dunfe, a town in Scotland, about 15 miles from Berwick; and, to secure him more effectually, Mackenzie makes him defended from the Dunfies in the Mers. MacCaghwell, an Irish author, who wrote the life of this Scotus, proves him to have been born at Down in the province of Ulster in Ireland: but Leland, Bale, Camden, and Pits, assure us, that he was born at Dunstone in the parish of Emildune, near Alnwick in Northumberland; and this opinion is rendered probable by the following conclusion of his manuscript works in the library of Merton college in Oxford.—“Here end the writings of that subtle doctor of the university of Paris, John Duns, who was born in a certain village, in the parish of Emildune, called *Dunston*, in the county of Northumberland.” We are told, that, when a boy, he became accidentally known to two Franciscan friars; who, finding him to be a youth of very extraordinary capacity, took him to their convent at Newcastle, and afterwards persuaded him to become one of their fraternity. From thence he was sent to Oxford, where he was made fellow of Merton college and professor of divinity; and Mackenzie says, that not less than 30,000 students came to Oxford to hear his lectures. His fame was now become so universal, that the general of his order commanded him to go to Paris, that the students of that university might also profit from his lectures. He went to Paris in the year 1304, where he was honoured first with the degree of bachelor, then of doctor of divinity, and in 1307 was appointed regent of the divinity schools: during his residence here, the famous controversy about the *Immaculate conception of the virgin Mary* arose. Albertus Magnus maintained that she was born in original sin. Scotus advanced 200 arguments in support of the contrary opinion, and convinced the university of Paris that she was really conceived immaculate. This important non-sense, however, continued to be disputed till the year 1496, after the council of Basil, when the university of Paris made a decree, that no student, who did not believe the *immaculate conception*, should be admitted to a degree. Our author had not been above a year at Paris, when the same general of the Franciscans ordered him to remove to Cologne; where he was received with great pomp and ceremony by the magistrates and nobles of that city, and where he died of an apoplexy soon after his arrival, in the year 1308, in the 34th year of his age. Some writers have reported, that Scotus was buried in an epileptic fit; and that, upon removing his bones, he appeared to have turned himself in his coffin. This *doctor subtilis* was doubtless one of the first wranglers of his time, admirably well versed in scholastic divinity, and a most indefatigable scribbler; but the misfortune is, that all his huge volumes do not contain a single page worth the perusal of a rational being. He was the author of a new sect of schoolmen called *Scotists*; who opposed the opinions of the Thomists, so called from St Thomas Aquinas. The reader will find a more particular ac-

count of Scotus in the Franciscan Martyrology, published at Paris in 1638.—He was a most voluminous writer; his works making 12 vols. folio, as published at Lyons by Luke Wadding, 1639.

DUNSTABLE, a town in Bedfordshire, with a market on Wednesdays. It is seated on a chalky hill; and has ponds in the streets, which are never dry tho' only supplied with rain water. It is remarkable for several good inns, it being a great thoroughfare on the northern road. It consists of four streets, intersecting each other at right angles; and in the centre stood one of those beautiful crosses of queen Eleanor, which was destroyed by the enthusiasts in the time of the civil wars. W. Long. o. 29. N. Lat. 51. 50.

DUNSTAFFNAGE. See LORNE.

DUNSTAN, a famous saint, and archbishop of Canterbury; of whom the monkish historians give us the following account. He was descended from a noble family in Wessex, and educated in the abbey of Glastonbury. Here he studied so hard, that it threw him into a violent fever which brought him to the very point of death. When the whole family were standing about his bed, dissolved in tears, and expecting every moment to see him expire, an angel came from heaven in a dreadful storm, and gave him a medicine which restored him to perfect health in a moment. Dunstan immediately started from his bed, and run with all his speed towards the church to return thanks for his recovery; but the devil met him by the way, surrounded by a great multitude of black dogs, and endeavoured to obstruct his passage. This would have frightened some boys; but it had no such effect upon Dunstan; who pronouncing a sacred name, and brandishing his stick, put the devil and all his dogs to flight. The church-doors being shut, an angel took him in his arms, conveyed him through an opening in the roof, and set him softly down on the floor, where he performed his devotions. After his recovery, he pursued his studies with the greatest ardor, and soon became a perfect master in philosophy, divinity, music, painting, writing, sculpture, working in gold, silver, brass, and iron, &c. When he was still very young he entered into holy orders, and was introduced by his uncle Athelm archbishop of Canterbury to King Athelstan; who, charmed with his person and accomplishments, retained him in his court, and employed him in many great affairs. At leisure hours he used to entertain the king and his courtiers with playing on his harp, or some other musical instrument; and now and then he wrought a miracle, which gained him great admiration. His old enemy the devil was much offended at this, and prompted some envious courtiers to persuade the king that his favourite was a magician, which that prince too readily believed. Dunstan discovering by the king's countenance that he had lost his favour, and resolving to resign rather than be turned out, retired from court to another uncle, who was bishop of Winchester. This good prelate prevailed upon his nephew to forsake the world and become a monk; after which he retired to a little cell built against the church-wall of Glastonbury. Here he slept, studied, prayed, meditated, and sometimes amused himself with forging several useful things in brass and iron. One evening, as he was working very busily at his

Dunstable

Dunstan.

Dunstan. forge, the devil, putting on the appearance of a man, thrust his head in at the window of his cell, and asked him to make something or other for him. Dunstan was so intent upon his work that he made no answer; on which the devil began to swear and talk obscenely, which betrayed the lurking fiend. The holy blacksmith, putting up a secret ejaculation, pulled his tongs, which were red-hot, out of the fire, seized the devil with them by the nose, and squeezed him with all his strength; which made his infernal majesty roar and scold at such a rate, that he awakened and terrified all the people for many miles around. Thus far the legend.

Ridiculous as were these fictions, they served, in those times of ignorance, to procure Dunstan a reputation which has been confirmed by the authority of several succeeding historians. * It appears that this extraordinary person was recalled to court by king Edmund, A. D. 941; who bestowed upon him the rich abbey of Glanbury, which for his sake he honoured with many peculiar privileges. He enjoyed a very high degree of the favour of this prince during his short reign of six years; but he stood much higher in the favour of his brother and successor king Edred, to whom he was confessor, chief confidant, and prime minister. He employed all his influence during this period of court-favour in promoting the interest of the monks of the Benedictine order, to which he belonged, and of which he was a most active and zealous patron. Having the treasures of these two princes, especially of the last, very much at his command, he lavished them away in building and endowing monasteries for these monks, because almost all the old monasteries were in the possession of secular canons. Not contented with this, he persuaded Edred (who was a bigotted valetudinary) to bestow such immense treasures on the churches and monasteries by his last will, that the crown was stripped of its most valuable possessions, and left in a state of indigence. This conduct of Dunstan, while he was in power, rendered him very odious to Edwi, who succeeded his uncle Edred A. D. 955; and his rude behaviour to himself, and his beloved queen Elgiva, raised the resentment of that prince so high, that he deprived him of all his preferments, and drove him into exile *. The banishment of Dunstan, the great patron, or (as Malmfbury calls him) the prince of monks, was a severe blow to that order, who were expelled from several monasteries; which were made the impure stables (according to the same author) of the married clergy. But their sufferings were not of long continuance. For Edgar, the younger brother of Edwi, having raised a successful rebellion against his unhappy brother, and usurped all his dominions on the north side of the river Thames, recalled Dunstan, and gave him the bishopric of Worcester, A. D. 957. From this moment he was the chief confidant and prime minister of king Edgar, who became sole monarch of England A. D. 959, by the death of his elder brother Edwi. In the following year Dunstan was raised to be archbishop of Canterbury; and being thus possessed of the primacy, and assured of the royal support and assistance, he prepared to execute the grand design which he had long meditated, of compelling the secular canons to put away their wives and become monks; or of driving them

out and introducing Benedictine monks in their room. With this view he procured the promotion of Oswald to the see of Worcester, and of Ethelwald to that of Winchester; two prelates who were monks themselves, and animated with the most ardent zeal for the advancement of their order. And these three great champions of the order found means, by their arts and intrigues, in the course of a few years, to fill no fewer than 48 monasteries with Benedictines. But on the death of Edgar in 975 they received a check. The sufferings of the persecuted canons had excited much compassion; and many of the nobility, who had been overawed by the power and zeal of the late king, now espoused their cause and promoted their restoration. Elfre Duke of Mercia drove the monks by force out of all the monasteries in that extensive province, and brought back the canons, with their wives and children; while Elfwyn Duke of East Anglia, and Brithnot Duke of Essex, raised their troops to protect the monks in these countries. To allay these commotions, several councils were held: in which Dunstan was so hard pushed by the secular canons and their friends, that he was obliged to practise some of his holy stratagems; and finally, by dint of miracles, overcame all opposition *.

St Dunstan died A. D. 988, in the 64th year of his age, having held the bishopric of London, together with the archbishopric of Canterbury, about 27 years. As this prelate was the great restorer and promoter of the monastic institutions, the grateful monks, who were almost the only historians of those dark ages, have loaded him with the most extravagant praises, and represented him as the greatest wonder-worker and highest favourite of heaven that ever lived. To say nothing of his many conflicts with the devil, in which he often belaboured that enemy of mankind most severely, the following short story, which is told with great exaltation by his biographer Osborn, will give the reader some idea of the astonishing impety and impudence of those monks, and of the no less astonishing blindness and credulity of those unhappy times. "The most admirable, the most inestimable Father Dunstan (says that author), whose perfections exceeded all human imagination, was admitted to behold the mother of God and his own mother in eternal glory: for before his death he was carried up into heaven, to be present at the nuptials of his own mother with the Eternal King, which were celebrated by the angels with the most sweet and joyous songs. When the angels reproached him for his silence on this great occasion, so honourable to his mother, he excused himself on account of his being unacquainted with those sweet and heavenly strains; but being a little instructed by the angels, he broke out into this melodious song, O King and Ruler of nations," &c. It is unnecessary to make any comment on this most shocking story.

The violent and too successful zeal of Dunstan and his associates, in promoting the building and endowing so great a number of houses for the entertainment of useless monks and nuns, was very fatal to their country: for by this means a spirit of irrational unmanly superstition was diffused amongst the people, which debased their minds and diverted them from nobler pursuits; and a very great proportion of the lands of England being put into hands who contributed nothing.

Dunstan.

* See *Engl. land*, n^o 64.

* See *Engl. land*, n^o 57.

Dunum
||
Duplica-
ture.

thing to its defence, rendered it an easy prey, first to the insulting Danes, and afterwards to the victorious Normans.

DUNUM, a Celtic term, denoting a hill or eminence, and which often concurs to form the names of towns, to signify their high situation, places of strength or citadels, hills or eminences, being adapted to such structures. See DUN.

DUNUM (Ptolemy), a town of Ireland; now thought to be *Down* or *Down-Patrick*, in the county of Down. W. Long. 5. 57. N. Lat. 54. 23.

DUO, in music, a song or composition, to be performed on two parts only, one sung, the other played on an instrument, or by two voices.

Duo is also when two voices sing different parts, as accompanied with a third, which is a thorough bass. It is seldom that unisons and octaves are used in duos, except at the beginning and end.

DUODECIMA, in music, is the twelfth or the fifth doubled.

DUODENUM. See ANATOMY, p. 127.

DUPIN (Lewis Ellis), a learned doctor of the Sorbonne, and one of the greatest critics of his time, especially in ecclesiastical matters, was born at Paris in 1657. When he published the first volume of his *Bibliothèque Universelle des Auteurs Ecclesiastiques*, in 1686, the liberty with which he treated some ecclesiastical writers, gave such offence, that M. de Harlay, archbishop of Paris, obliged Dupin to retract many propositions, and suppressed the work. He was nevertheless suffered to continue it, by altering the title from *Bibliothèque Universelle*, to *Bibliothèque Nouvelle*. This great undertaking continued in several successive volumes, though sufficient to occupy the life of an ordinary man, did not hinder M. Dupin from obliging the world with several other works. He was a man of prodigious reading; and had an easy happy way of writing, with an uncommon talent at analysing the works of an author; which makes his Ecclesiastical Bibliothèque so valuable. M. Dupin was professor of philosophy in the royal college; but was banished some time from the chair to Chateaufort, on account of the famous *Cas de Conscience*; but was restored, and died in 1719.

DUPLE, among mathematicians, denotes the ratio of 2 to 1. Thus the ratio of 8 to 4 is duple, or as 2 to 1.

Sub-Duple Ratio, is just the reverse of the former, or as 1 to 2. Such is 4 to 8, or 6 to 12.

DUPLICATE, among lawyers, denotes a copy of any deed, writing, or account. It is also used for the second letters-patent, granted by the lord chancellor in a case wherein he had before done the same. Also a second letter written and sent to the same party and purpose as a former, for fear of the first's miscarrying, is called a duplicate.

DUPLICATE Proportion or *Ratio*. See RATIO.

DUPLICATION, in general, signifies the doubling of any thing, or multiplying of it by 2: also the folding of any thing back again on itself.

DUPLICATURE, among anatomists, a term used to denote the folds of any membrane or vessel: thus we say, the *duplicatures of the intestines, peritoneum*, &c.

Dupondius
||
Ducet.

DUPONDIUS, in antiquity, a weight of two pounds, or a money of the value of two asles. See AS.

As the as at first weighed a just pondo or libra, the dupondius then weighed two; and hence the name.

And though the weight of the as was afterwards diminished, and of consequence that of the dupondius also, yet they still retained the denomination. See POUND and LIBRA.

DUPPA (Brian), a learned English bishop born in 1589 at Lewisham in Kent, of which place his father was then vicar. In 1634, he was instituted chancellor of the church at Sarum, and soon after made chaplain to Charles I. He was appointed tutor to Charles prince of Wales, and his brother James duke of York; was made bishop of Chichester; and in 1641 translated to Salisbury, though the confusions that followed deprived him of all benefit from his promotion. Charles I. held him in high esteem, and he is said to have assisted the king in composing the *Eikon Basilike*. On the Restoration he was made bishop of Winchester, and lord high almoner; but died in 1662. He bequeathed large sums to charitable purposes: and published a few sermons, with other religious pieces.

DURANDUS (William), born at Puimoisson in Provence, in the 13th century, was one of the most knowing lawyers of his time. Pope Martin made him one of his nuncios, and then bishop of Mende and Langue doc. His *Speculum Juris* gave him the name of *Speculator*; his second piece was *Rationale divinarum officiorum*, containing eight books. He wrote several others.

DURANTA, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 40th order, *Perfonate*. The calyx is quinquefid, superior; the berry tetraepermous; the seeds bilocular.

DURATION, an idea we get by attending to the fleeting and perpetual perishing parts of succession. See METAPHYSICS.

DURATION, as marked by certain periods and measures, is what we most properly call *time*. See TIME.

DURATION of Action, according to Aristotle, is confined to a natural day in tragedy; but the epoea, according to the same critic, has no fixed time. See POETRY.

DURER (Albert), defended of an Hungarian family, and born at Nuremberg in 1471, was one of the best engravers and painters of his age. He was at the same time a man of letters and a philosopher; and he was an intimate friend of Erasmus, who revised some of the pieces which he published. He was a man of business also, and for many years the leading magistrate of Nuremberg. Though not the inventor, he was one of the first improvers of the art of engraving; and he bethought himself of working also in wood, for expedition, having an inexhaustible fund of designs. In many of those prints which he executed on copper, the engraving is elegant to a great degree. His *Hell Scene* particularly, which was engraved in the year 1513, is as highly finished a print as ever was engraved, and as happily executed. In his wooden prints too we are surprised to see so much meaning in so early a master; the heads so well marked, and every part so well executed.

Duresse
||
Durham.

cuted.—This artist seems to have understood the principles of design. His composition, too, is often pleasing; and his drawing generally good. But he knows very little of the management of light; and still less of grace: and yet his ideas are purer and more elegant than we could have supposed from the awkward archetypes which his country and education afforded. In a word, he was certainly a man of a very extensive genius; and, as Vafari remarks, would have been an extraordinary artist, if he had had an Italian instead of a German education. His prints are very numerous. They were much admired in his own life-time, and eagerly bought up; which put his wife, who was a teasing woman, upon urging him to spend more time upon engraving than he was inclined to do. He was rich; and chose rather to practise his art as an amusement than as a business. He died in the year 1527.

DURESSE, *HARDSHIP*, in law, is where a person is kept in prison or restrained of his liberty, contrary to order of law; or is threatened to be killed, maimed, or beaten. In which case, if a person go in prison, or in fear of such threats, make any specialty or obligation, by reason of such imprisonment or threats, such deed is void in law; and in an action brought on such specialty, the party may plead, that it was brought by *duresse*.

D'URFEY (Thomas), an eminent English satyrist and songster, whose name, though as well known as that of any writer extant, yet there are very few particulars of his life to be collected. He was born in Devonshire; but when, where, or of what family, are all uncertain. He was bred to the law, which he forsook for the more agreeable employment of writing plays and songs; and the latter he had so happy a talent both of writing and singing, that he received many favours from persons of quality on that account. Even crowned heads did not disdain his company. The writer, of the *Guardian*, N^o 67. tells us, he remembered to have seen Charles II. leaning on Tom D'Urfe's shoulder more than once, humming over a song with him. This indeed was not extraordinary in so merry a monarch; but even the phlegmatic king William could relax his muscles on hearing him sing. He was certainly by all accounts a cheerful, honest, good-natured man: but as this character does not include prudence, D'Urfe grew poor as he grew old; and prevailing on the managers of the playhouse to act his comedy of the *Platting Sisters* for his benefit, Mr Addison wrote the abovementioned paper in the *Guardian*, with another, N^o 82. representing him in a good humoured light, to procure him a full house. He died very old, in 1723.

DURHAM (bishopric of), one of the counties of England. Before the arrival of the Romans it was included in the British principality of the Brigantes, and after their arrival made part of the province of Maxima Caesariensis. During the Heptarchy it made part of the kingdom of Northumberland, the 5th established, which began in 547, and ended in 827, having been governed by 31 kings. It was not mentioned by Alfred in his division of counties, being at that time considered as a part of Yorkshire. At present it is included in the northern circuit, in the province of York; and is a diocese and principality under the go-

vernment of its own bishop, being a county palatine, the second in rank, and the richest in England. It is bounded on the north by Northumberland, on the south by Yorkshire, on the east by the North Sea, and on the west by Cumberland. It is 39 miles long, 35 broad, and 107 in circumference; containing 410,000 square acres, or 758 square miles; with 97,000 inhabitants, 80 parishes, 21 vicarages, one city (Durham), and 9 market-towns, viz. Stockton, Sunderland, Barnard-Castle, Darlington, Stanhope, Hartlepool, Aukland, Staindrop, and Marwood; besides 223 villages. It is divided into 4 wards, sends 4 members to parliament, pays three portions of the land-tax, and provides 400 of the national militia. It has 21 parks, 4 castles, and 20 bridges, with the rivers Tees, Tine, Were, Tame, Lune, Darwent, Gauntles, Skern, &c. The Lune and Teesdale forests. Its principal products are lead, coals, iron, corn, mustard, salt, glass, fine ale, with excellent butter and salmon. The soil is various; the south is rich, but the western parts rocky and moorish.

Durham, as already observed, is a county palatine, governed by the bishop, who had formerly great prerogatives. He had power to create barons, appoint judges, convoke parliaments, raise taxes, and coin money. The courts of justice were kept in his name; and he granted pardons for trespasses, alienations, rapes, murders, and felonies of every denomination. He erected corporations, granted markets and fairs, created officers by patent, was lord admiral of the seas and waters within the county palatine; great part of the lands were held of the see *in capite*. In a word, he exercised all the power and jurisdiction of a sovereign prince. How and at what period these prerogatives were obtained, it is not easy to determine. Malmbury says, the lands were granted by king Alfred, who likewise made the church a sanctuary for criminals. This see was anciently called the *patrimony of St Cuthbert*, who had been bishop of Landisfarne or Holy Island near Berwick. His bones being transferred to Durham, were long esteemed as precious relics; and the people of the county considered themselves as Halwerk men, exempted from all other but holy work, that is, the defence of St Cuthbert's body. Certain it is, they pretended to hold their lands by this tenure; and refused to serve out of the county either for the king or bishop; but king Edward I. broke through these privileges, and curtailed the prerogatives of the bishops, which were still further abridged by Henry VIII. Nevertheless, the bishop is still earl of Sadberg, a place in this county which he holds by barony. He is sheriff paramount, and appoints his own deputy, who makes up his audit to him, instead of accounting to the exchequer. He has all the forfeitures upon outlawries; and he and his temporal chancellor act as justices of the peace for the county palatine, which comprehends Creke in Yorkshire, Bedlington, Northam, and Holy Island, in Northumberland, the inhabitants of these places having the benefit of the courts at Durham. The judges of assize, and all the officers of the court, have still their ancient salaries from the bishop; and he constitutes the standing officers by his letters patent. He has the power of presiding in person in any of the courts of judicature. Even when judgment of blood

Durham.

Durham. is given, this prelate may fit in court in his purple robes, though the canons forbid any clergyman to be present in such cases: hence the old saying, *Solum Dunelmense stola jure dicit et ense*. It was not till the reign of Charles II. that the bishopric sent representatives to parliament.

DURHAM, the capital of the above mentioned county, is situated in W. Long. 1. 14. N. Lat. 54. 50. It stands on a hill almost surrounded by the river Woe; and is considerable for its extent and the number of its inhabitants, as well as for being the see and seat of the bishop, who is lord paramount. It stands about 280 miles north from London; being remarkable for the salubrity of its air, and the abundance and cheapness of its provisions. These circumstances have induced a great deal of good company to take up their residence at Durham, which is still further animated by the presence and court of the bishop and his clergy. The town is said to have been built about 70 years before the Norman conquest, on occasion of bringing hither the body of St Cuthbert. It was first incorporated by king Richard I. but queen Elizabeth extended its privileges. At length, in the year 1684, it obtained a charter; in consequence of which, it is now governed by a mayor, 12 aldermen, 12 common council men, with a recorder, and inferior officers. These can hold a court-leet and court-baron within the city; but under the style of the bishop, who as count palatine appoints a judge, steward, sheriffs, and other inferior magistrates. The mayor and aldermen also keep a *pie pouldres* court at their fairs, and pay a yearly toll to the bishop. They have a weekly market on Saturday, and three annual fairs. Durham is about a mile in length, and as much in breadth, resembling the figure of a crab, the market-place exhibiting the body, and the claws being represented by the streets, which bend according to the course of the river, that almost surrounds one part of the city. They are, moreover, dark and narrow; and some of them lying on the acclivity of a steep hill, are very difficult and dangerous to wheel-carriages. The houses are in general strong built, but neither light nor elegant. The most remarkable edifices are the cathedral with six other churches, three standing in the city, and as many in the suburbs; the college; the castle, or bishop's palace; the tolbooth near St Nicholas's church; the cross and conduit in the market-place; with two bridges over the Elvet. The cathedral was begun by bishop Carlisle in the 11th century. It is a large, magnificent, Gothic structure, 411 feet long, and 80 in breadth, having a cross aisle in the middle 170 feet in length, and two smaller aisles at each end. On the fourth-side is a fine cloister; on the east, the old library, the chapter-house, and part of the deanery; on the west, the dormitory, under which is the treasury and a chantry; and on the west side is the new library, an elegant building begun by dean Sudbury about 70 years ago, on the spot where stood the old refectory of the convent. The middle tower of the cathedral is 212 feet high. The whole building is arched and supported by huge pillars. Several of the windows are curiously painted; and there is a handsome screen at the entrance into the choir. Sixteen bishops are interred in the chapter-house, which is 75 feet long and 33 broad, arched over-head, with a magnificent seat at the upper end for the infirmament of

the bishops. The confistory is kept in the chapel or west aisle called *Gaithe*, which was built by bishop Pudsey, and had formerly 16 altars for women, as they were not allowed to advance farther than the line of marble by the side of the font; here likewise are deposited the bones of the venerable Bede, whose elogium is written on an old parchment scroll that hangs over his tomb. The long cross aisle, at the extremity of this church, was formerly distinguished by nine altars, four to the north, and four to the south, and the most magnificent in the middle dedicated to the patron St Cuthbert, whose rich shrine was in this quarter, formerly much frequented by pilgrims. The church is possessed of some old records relating to the affairs of Scotland, the kings of which were great benefactors to this cathedral. The ornaments here used for administering the divine offices, are said to be richer than those of any other cathedral in England. Before the reformation, it was distinguished by the name *Ecclesia sancte Marie et sancti Cuthberti*; but it obtained the appellation of *Ecclesia cathedralis Christi et beate Marie*, in the reign of Henry VIII, who endowed the deanery with 12 prebendaries, 12 minor canons, a deacon, sub-deacon, 16 lay singing men, a schoolmaster and usher, a master of the choir, a divinity reader, eight alms-men, 18 scholars, 10 choiristers, two vergers, two porters, two cooks, two butlers, and two sacristans. On the fourth-side of the cathedral is the college; a spacious court formed by the houses of the prebendaries, who are richly endowed and extremely well lodged. Above the college-gate, at the east end, is the exchequer; and at the west, a large hall for entertaining strangers, with the granary and other offices of the convent. The college-school, with the master's house, stands on the north side of the cathedral. Between the churchyard and castle, is an open area called the *palace green*; at the west end of which stands the shire-hall, where the assizes and sessions are held for the county. Hard by is the library built by bishop Cosin; together with the exchequer raised by bishop Nevil, in which are kept the offices belonging to the county-palatine court. There is an hospital on the east, endowed by bishop Cosin, and at each end of it are two schools founded by bishop Langley. On the north, is the castle built by William the Conqueror, and afterwards converted into the bishop's palace, the outward gate of which is at present the county-goal.

The city consists of three manors; the bishop's manor, containing the city liberties and the bailey, held of him by the service of castle-guard; the manor of the dean and chapter, consisting of the Elvet's cross gate, fourth-gate street; and the manor of Gilligate, formerly belonging to the dissolved hospital of Kepar in this neighbourhood, but granted by Edward VI. to John Cockburn, lord of Ormilton, and late in the possession of John Templet, Esq.

The bishopric of Durham is deemed the richest bishopric in the kingdom; and the prebends are frequently styled the Golden Prebends of Durham. The diocese contains the whole counties of Durham and Northumberland, except the jurisdiction of Hexham in the latter. It hath also one parish in the county of Cumberland: making in the whole 135 parishes, whereof 87 are impropriate. The fee is valued in the king's books at L. 2821 : 1 : 5½, but is computed to be

Durham.

Durio
Durotriges

he worth annually L. 8700. The clergy's tithes amount to L. 385 : 5 : 64. It has two archdeacons, viz. of Durham and Northumberland. This see hath given to the church of Rome eight saints and one cardinal; and to the English nation one lord chief justice, five lord chancellors, three lord treasurers, one principal secretary of state, one chancellor to the university of Oxford, and two masters of the rolls.

In the neighbourhood of this city is Nevil's cross, famous for the battle fought in the year 1346, against David II. king of Scotland, who was defeated and taken.

DURIO, in botany: A genus of the polyandria order, belonging to the polyadelphia class of plants. The calyx is a monophyllous perianthium; the corolla has five petals growing to the calyx; the stamina are conjoined in five bodies; the germ is roundish; the style bristly, the length of the stamina. The fruit is a roundish apple every where mucicated; the seeds have a mucous orilla.

DURNUM, or **DURNOVARIA**, a town of the Durotriges in Britain. Now *Dorchester*, the capital of Dorsetshire, on the Frome.

DUROBRIVE (anc. geog.), a town of the Caty-euchlani in Britain. Now in ruins, which lie on the Nen, between Caister and Dornford, in Northamptonshire, on the borders of Huntingdon.

DUROBRIVE, or *Durocobriva*, a town of the Trinobantes, in Britain; whose ruins are situated between Flamstead and Redburn, in Hertfordshire.

DUROBRIVIS, 25 miles to the west of Durovernum, or Canterbury; from which it appears to be Rochester town, confirmed by the charter of foundation of the church, in which it is called *Durobrevis*.

DUROCASSES, **DUROCASSIUM**, **DUROCASSÆ**, and **DUROCASSES**, a town of the Carnutes, in Gallia Celtica; now Dreux. See *Dreux*.

DUROCORNIVM (anc. geog.), a town of Britain; now *Cirencester*, in Gloucestershire (Camden), Called *Corinium* by Ptolemy.

DUROCORTORUM, or **DUROCORTORA**, a town of the Rheini in Belgia; now *Rheims* in Champaign. E. Long. 4. N. Lat. 49. 20.

DUROIA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants. The calyx above is cylindrical and loped; the border fix-parted; there are no filaments; the fruit a hispid apple.

DUROLENUM, a town of the Cantii in Britain; now *Lenham*, in Kent (Camden); *Charing* (Talbot).

DUROLITUM, a town of the Trinobantes; now *Leiton*, on the Ley, in Essex (Camden).

DUROTIGES, an ancient British nation, seated in that part of the country which is now called *Dorsetshire*. Their name is derived from the two British words *Dur* "water," and *Trigo* "to dwell;" and it is no less evident that they got their name from the situation of their country, which lies along the sea-coast. It is not very certain whether the Durotriges formed an independent state under a prince of their own, or were united with their neighbours the Damnonii; as they were reduced by Vespasian under the dominion of the Romans, at the same time, and with the same ease, and never revolted. The peaceable disposition of the inhabitants was probably the reason that the Ro-

mans had so few towns, forts, and garrisons, in this pleasant country. *Dorchester*, its present capital, seems to have been a Roman city of some consideration, though our antiquaries are not agreed about its Roman name. It is most probable that it was the *Durnovaria* in the 12th Iter of Antoninus. Many Roman coins have been found at *Dorchester*; the military way, called *Jenning-Street*, passed through it; and some vestiges of the ancient stone wall with which it was surrounded, and of the amphitheatre with which it was adorned, are still visible. The country of the Durotriges was included in the Roman province called *Flavia Caesariensis*, and governed by the præfident of that province, as long as the Romans kept any footing in these parts.

DURY (John), a Scots divine, who travelled much, and laboured with great zeal to reunite the Lutherans with the Calvinists. His discouragements in this scheme started another still more impracticable; and this was to reunite all Christians by means of a new explication of the Apocalypse, which he published at Francfort in 1675. He enjoyed then a comfortable retreat in the country of Hesse; but the time of his death is unknown: his letter to Peter du Moulin concerning the state of the churches of England, Scotland, and Ireland, was printed at London in 1658, by the care of du Moulin, and is esteemed to be curious.

DUSSELDORP, a city of Westphalia in Germany, and capital of the duchy of Berg. It is situated at the conflux of the river Dussel with the Rhine, in E. Long. 6. 20. N. Lat. 51. 15.

DUTCHY. See *Duchv*.

DUTY, in general, denotes any thing that one is obliged to perform.

DUTY, in a moral sense. See *Moral Philosophy*.

DUTY, in polity and commerce, signifies the impost laid on merchandizes, at importation or exportation, commonly called the duties of customs; also the taxes of excise, stamp-duties, &c. See *CUSTOMS*, *EXCISE*, &c.

The principle on which all duties and customs should be laid on foreign merchandizes which are imported into these kingdoms, are such as tend to cement a mutual friendship and traffic between one nation and another; and therefore due care should be taken in the laying of them, that they may answer for good an end, and be reciprocal in both countries: they should be so laid as to make the exports of this nation at least equal to our imports from those nations wherewith we trade, so that a balance in money should not be issued out of Great Britain, to pay for the goods and merchandizes of other countries; to the end that no greater number of our landholders and manufacturers should be deprived of their revenues arising from the product of the lands, and the labour of the people, by foreign importations, than are maintained by exportations to such countries. These are the national principles on which all our treaties of commerce with other countries ought to be grounded.

DUTY, in the military art, is the exercise of those functions that belong to a soldier: with this distinction, that mounting guard and the like, where there is no enemy directly to be engaged, is called duty; but their marching to meet and fight an enemy is called going on service.

DUUM-

Dury
Duty

DUUMVIRATE, the office or dignity of the duumviri. See the next article.

The duumvirate lasted till the year of Rome 388, when it was changed into a decemvirate.

DUUMVIRI, in Roman antiquity, a general appellation given to magistrates, commissioners, and officers, where two were joined together in the same functions.

DUUMVIRI Capitales were the judges in criminal causes: from their sentence it was lawful to appeal to the people, who only had the power of condemning a citizen to death. These judges were taken from the body of the decuriones; they had great power and authority, were members of the public council, and had two lictors to walk before them.

DUUMVIRI Municipales, were two magistrates in some cities of the empire, answering to what the consuls were at Rome: they were chosen out of the body of the decuriones; their office lasted commonly five years, upon which account they were frequently termed *quinquennales magistratus*. Their jurisdiction was of great extent: they had officers who walked before them, carrying a small switch in their hands; and some of them assumed the privilege of having lictors, carrying axes and the fasces, or bundles of rods, before them.

DUUMVIRI Navales, were the commissaries of the fleet, first created at the request of M. Decius, tribune of the people, in the time of the war with the Samnites. The duty of their office consisted in giving orders for the fitting of ships, and giving their commissions to the marine officers, &c.

DUUMVIRI Sacrorum, were magistrates created by Tarquinius Superbus, for the performance of the sacrifices, and keeping of the sibyls books. They were chosen from among the patricians, and held their office for life: they were exempted from serving in the wars, and from the offices imposed on the other citizens, and without them the oracles of the sibyls could not be consulted.

DUYVELAND, or **DIVELAND**, one of the islands of Zealand, in the United Provinces, lying eastward of Schonen, from which it is only separated by a narrow channel.

DWAL, in heraldry, the herb nightshade, used by such as blazon with flowers and herbs, instead of metals and colours, for fable or black.

DWARF, in general, an appellation given to things greatly inferior in size to that which is usual in their several kinds: thus there are dwarfs of the human species, dwarf-dogs, dwarf-trees, &c.

The Romans were passionately fond of dwarfs, whom they called *nani* or *nane*, inasmuch that they often used artificial methods to prevent the growth of boys designed for dwarfs, by inclosing them in boxes, or by the use of tight bandages. Augustus's niece, Julia, was extremely fond of a dwarf called *Senopas*, who was only two feet and an hand-breadth high.—We have many other accounts of human dwarfs, but most of them deformed in some way or other besides the smallness of their size. Many relations also concerning dwarfs we must necessarily look upon to be fabulous, as well as those concerning giants.—The following history, however, which we have reason to look upon as authentic, is too remarkable not to be acceptable to the generality of our readers.

Jeffery Hudfon, the famous English dwarf, was born at Oakham in Rutlandshire in 1619; and about the age of seven or eight, being then but 18 inches high, was retained in the service of the duke of Buckingham, who resided at Burleigh on the Hill. Soon after the marriage of Charles I. the king and queen being entertained at Burleigh, little Jeffery was served up to table in a cold pye, and presented by the duchess to the queen, who kept him as her dwarf. From 7 years of age till 30, he never grew taller; but after 30, he shot up to three feet nine inches, and there fixed. Jeffery became a considerable part of the entertainment of the court. Sir William Davenant wrote a poem called *Jeffridas*, on a battle between him and a turkey-cock; and in 1638, was published a very small book, called the *New Year's Gift*, presented at court by the lady Parvula to the lord Minimus (commonly called *Little Jeffery*) her majesty's servant, &c. written by Microphilus, with a little print of Jeffery prefixed. Before this period, Jeffery was employed on a negotiation of great importance: he was sent to France to fetch a midwife for the queen; and on his return with this gentleman, and her majesty's dancing-master, and many rich presents to the queen from her mother Mary de Medicis, he was taken by the Dunkirkers. Jeffery, thus made of consequence, grew to think himself really so. He had borne with little temper the teasing of the courtiers and domestics, and had many squabbles with the king's gigantic porter. At last, being provoked by Mr Croits, a young gentleman of family, a challenge ensued; and Mr Croits coming to the rendezvous armed only with a squirt, the little creature was so enraged, that a real duel ensued; and the appointment being on horseback with pistols, to put them more on a level, Jeffery, with the first fire, shot his antagonist dead. This happened in France, whither he had attended his mistress in the troubles. He was again taken prisoner by a Turkish rover, and sold into Barbary. He probably did not remain long in slavery: for at the beginning of the civil war, he was made a captain in the royal army; and in 1644 attended the queen to France, where he remained till the Restoration. At last, upon suspicion of his being privy to the Popish plot, he was taken up in 1682, and confined in the Gatehouse, Westminster, where he ended his life, in the 63d year of his age.

In the Memoirs of the Royal Academy of Sciences, a relation is given by the Count de Tressan, of a dwarf called *Bebe*, kept by the late Stanislaus king of Poland, and who died in 1764 at the age of 23, when he measured only 33 inches. At the time of his birth, he measured only between eight and nine inches. Diminutive as were his dimensions, his reasoning faculties were not less scanty; appearing indeed not to have been superior to those of a well-taught pointer: but that the size and strength of the intellectual powers are not affected by the diminutiveness or tenuity of the corporeal organs, is evident from a still more striking instance of littleness, given us by the same nobleman, in the person of Monsieur Borulawski, a Polish gentleman, whom he saw at Luneville, who has since been at Paris, and who at the age of 22 measured only 28 inches. This miniature of a man, considering him only as to his bodily dimensions, appears a giant with regard to his mental powers and attainments.

ments. He is described by the count as possessing all the graces of wit, united with a sound judgment and an excellent memory; so that we may with justice say of M. Borulawski, in the words of Seneca, and nearly in the order in which he has used them, "*Possit ingenium fortissimum ac beatissimum sub quolibet corpusculo latere.*" Epist. 66.

Count Borulawski was the son of a Polish nobleman attached to the fortunes of king Stanislaus, who lost his property in consequence of that attachment, and who had six children, three dwarfs, and three well-grown. What is singular enough, they were born alternately, a big one and a little one, though both parents were of the common size. The little count's youngest sister was much less than him, but died at the age of 23. The count continued to grow till he was about 30, and has at present attained his 51st year, and the height of three feet two inches. He never experienced any sickness, but lived in a polite and affluent manner under the patronage of a lady, a friend of the family, till love at the age of 41 intruded into his little peaceful bosom, and involved him in matrimony, care, and perplexity. The lady he chose was of his own country, but of French extraction, and the middle size. They have three children, all girls, and none of them likely to be dwarfs. To provide for a family now became an object big with difficulty, requiring all the exertion of his powers (which could promise but little) and his talents, of which music alone afforded any view of profit. He plays extremely well upon the guitar: and by having concerts in several of the principal cities in Germany, he raised temporary supplies. At Vienna he was persuaded to turn his thoughts to England, where it was believed the public curiosity might in a little time benefit him sufficiently to enable him to live independent in so cheap a country as Poland. He was furnished by very respectable friends with recommendations to several of the most distinguished characters in this kingdom, as the duchess of Devonshire, Rutland, &c. &c. whose kind patronage he is not backward to acknowledge. He was advised to let himself be seen as a curiosity, and the price of admission was fixed at a guinea. The number of his visitors, of course, was not very great. After a pretty long stay in London he went to Bath and Bristol; visited Dublin and some other parts of Ireland; whence he returned by way of Liverpool, Manchester, and Birmingham, to London. He also visited Edinburgh and some other towns of Scotland. In every place he acquired a number of friends. In reality, the ease and politeness of his manners and address please no less than the diminutive, yet elegant, proportions of his figure astonish those who visit him. His person is pleasing and graceful, and his look manly and noble. He speaks French fluently, and English tolerably. He is remarkably lively and cheerful, though fitted for the most serious and rational conversation. Such is this wonderful little man—an object of curiosity really worthy the attention of the philosopher, the man of taste, and the anatomist. His life has been published, written by himself.

DWINA, the name of two large rivers; one of which rises in Lithuania, and, dividing Livonia from Courland, falls into the Baltic Sea a little below Riga: the N^o 105.

other gives name to the province of Dwina in Russia, discharging itself into the White Sea a little below Archangel.

DYCK. See VANDYCK.

DYE, in architecture, any square body, as the trunk or notched part of a pedestal: or it is the middle of the pedestal, or that part included between the base and the cornice; so called because it is often made in the form of a cube or dye. See ARCHITECTURE, n^o 61.

DYER, a person who professes the art of dyeing all manner of colours. See DYING.

DYER (Sir James), an eminent English lawyer, chief judge of the court of common pleas in the reign of Queen Elizabeth. He died in 1581; and about 20 years after was published his large collection of Reports, which have been highly esteemed for their succinctness and solidity. He also left other writings behind him relative to his profession.

DYER (John), the son of Robert Dyer, Esq; a Welsh solicitor of great capacity, was born in 1700. He passed through Westminster-school under the care of Dr Freind, and was then called home to be instructed in his father's profession. His genius, however, led him a different way; for besides his early taste for poetry, having a passion no less strong for the arts of design, he determined to make painting his profession. With this view, having studied a while under his master, he became, as he tells his friend, an itinerant painter, and wandered about South Wales and the parts adjacent; and about 1727 printed Grongar Hill. Being probably unsatisfied with his own proficiency, he made the tour of Italy; where, besides the usual study of the remains of antiquity, and the works of the great masters, he frequently spent whole days in the country about Rome and Florence, sketching those picturesque prospects with facility and spirit. Images from hence naturally transferred themselves into his poetical compositions: the principal beauties of The Ruins of Rome are perhaps of this kind; and the various landscapes in The Fleece have been particularly admired. On his return to England, he published The Ruins of Rome, 1740; but soon found that he could not relish a town-life, nor submit to the assiduity required in his profession. As his turn of mind was rather serious, and his conduct and behaviour always irreproachable, he was advised by his friends to enter into holy orders; and it is presumed, though his education had not been regular, that he found no difficulty in obtaining them. He was ordained by the bishop of Lincoln, and had a low degree conferred on him.

About the same time he married a lady of Colehill named Enfor; "whose grandmother (says he) was a Shakespeare, descended from a brother of every body's Shakespeare." His ecclesiastical provision was a long time but slender. His first patron, Mr Harper, gave him, in 1741, Calthorpe in Leicestershire, of 80 l. a-year, on which he lived ten years; and in April 1757 exchanged it for Belchford in Lincolnshire, of 75 l. which was given him by lord chancellor Hardwicke, on the recommendation of a friend to virtue and the muses. His condition now began to mend. In 1752, Sir John Heathcote gave him Coningsby, of 140 l. a-year; and in 1756, when he was LL. B. without any solicitation of his own, obtained for him from the chancellor Kirby

Dyer.

on Bane, of 1101. In 1757, he published *The Fleece*, his greatest poetical work; of which Dr Johnson relates this ludicrous story. Dodsley the bookseller was one day mentioning it to a critical visitor, with more expectation of success than the other could easily admit. In the conversation the author's age was asked; and being represented as advanced in life, "He will (said the critic) be buried in woollen." He did not indeed long outlive that publication, nor long enjoy the increase of his preferences; for a consumptive disorder, with which he had long struggled, carried him off at length in 1758.

Mr Dyer's character as a writer has been fixed by three poems, *Grongar Hill*, *The Ruins of Rome*, and *The Fleece*; wherein a poetical imagination perfectly original, a natural simplicity connected with and often productive of the true sublime, and the warmest sentiments of benevolence and virtue, have been universally observed and admired. These pieces were put out separately in his lifetime: but after his death, they were collected and published in one volume 8vo, 1761; with a short account of himself prefixed.

Dyer's Weed, in botany. See *RESEDA*.

Dyer's Weed.

D Y E I N G,

Antiquity of the art.

IN the utmost latitude of the word, may be defined, The art of tingeing cloth, stuff, or other matter, with a permanent colour, which penetrates the substance thereof.—It is, however, commonly restrained to the art of tingeing silk, wool, cotton, and linen, with different colours; and, as such, is practised as a trade by those who do not meddle with any of the other branches, as staining of leather, &c.

The dyeing art is of great antiquity; as appears from the traces of it in the oldest sacred as well as profane writers. The honour of the invention is attributed to the Tyrians; though what lessens the merit of it is, that it is said to have owed its rise to chance. The juices of certain fruits, leaves, &c. accidentally crushed, are supposed to have furnished the first hint: Pliny assures us, that even in his time the Gauls made use of no other dyes. It is added, that coloured earths and minerals, washed and soaked with rain, gave the next dyeing materials.—But purple, an animal juice found in a shell-fish called *murex**, *conchylum*, and *purpura*, seems from history to have been prior to any of them. This indeed was reserved for the use of kings and princes; private persons were forbidden by law to wear the least scrap of it. The discovery of its tingeing quality is said to have been taken from a dog, which having caught one of the purple fishes among the rocks, and eaten it up, stained his mouth and beard with the precious liquor; which struck the fancy of a Tyrian nymph so strongly, that she refused her lover Hercules any favours till he had brought her a mantle of the same colour.

Pliny seems to ascribe the invention of the art of dyeing wool to the Lydians of Sardis: *Inficere lanas Sardinibus Lydi*; where the word *incipere* must be understood. But a modern critic suspects a false reading here; and, not without reason, for *Lydi* substitutes *Lydda*, the name of a city on the coast of Phenicia, where the chief mart of the purple dye was.

After the Phenicians, the Sardinians seem to have arrived at the greatest perfection in the dyeing art; inasmuch that *βαρνα Σαρδινίω*, *Sardinian dye*, passed into a proverb among the Greeks. Till the time of Alexander, we find no other sort of dye in use among the Greeks but purple and scarlet.—It was under the successors of that monarch that these people applied themselves to the other colours; and invented, or at least perfected, blue, yellow, green, &c.—For the ancient purple, it has been long lost; but the perfection

to which the moderns have carried the other colours, abundantly indemnifies them of the loss. It is still, however, greatly to be doubted whether the permanency of the modern colours at all equals that of the ancient ones; though it is certain that the former greatly exceed them in brightness.

SECT. I. *Theory of Dyeing.*

BEFORE we can enter into any consideration of the Salts the true theory of dyeing, it is necessary to make the following observation concerning the practice, namely, That salts are almost the only means we are acquainted with by which any colouring substance can be made to fix itself upon those matters which are the common subjects of dyeing. A solution of cochineal, for instance, will of itself impart no permanent colour to a piece of woollen cloth put into it. The red colour of the cochineal will indeed stain the cloth while it remains immersed in the solution; but as soon as it is taken out and washed, this temporary stain will immediately vanish, and the cloth become as white as before. If now the cloth is dipped in the solution of any saline substance, alkalies alone excepted, and then immersed in the solution of cochineal for some time, it will come out permanently coloured; nor will the colour be discharged even by washing with soap and water. If a quantity of salt is added to the solution of cochineal, and the cloth put in without being impregnated with any saline substance, the effect will be the same; the cloth will come out coloured; only in this last case, it must be well dried before washing it with soap, or moist of the colour will be discharged.

By comparing this with what is delivered under the article *Colour-Making*, n° 13, 14, we shall be able to form a pretty rational theory of dyeing. It is there remarked, that a saline substance (solution of tin in aqua regia) had a surprising power of coagulating the colouring matter of certain solutions, such as cochineal, Brazil-wood, logwood, &c. If therefore a piece of cloth is previously impregnated with this solution, and put into the colouring one, it is plain that some part of the colouring matter will be coagulated by the solution remaining in the cloth, in the very same manner that it would have been if a small quantity of the saline solution had been poured into the other. The cloth therefore will take up a part of the colouring matter, which cannot be discharged but by entirely discharging the solution of tin. This, however, seems to unite

itself with the cloth very firmly, so that scarce a particle of colour will be discharged by washing in plain water, or even with soap; nor can the whole be taken out without boiling the cloth in a solution of fixed alkali.

Though solution of tin produces this coagulation in the most remarkable manner, it is not to be doubted that the same power is possessed in some degree by most of the neutrals and imperfect salts. Alum possesses it very considerably, though not so much as solution of tin; and hence that salt is very much used in dyeing, as well as sugar of lead, which also has a very strong power of coagulation. The process of dyeing, therefore, seems to be most analogous to that of the coagulation or curdling of milk. Before it has suffered this change, the milk is easily miscible with water; but after it is once coagulated, the curd, or caseous part, is very difficultly soluble in any liquid whatever. In like manner, the colouring matter in the solution of cochineal, before the cloth is put in, is easily soluble in water, and may be diffused through any quantity of fluid; but no sooner is the cloth dipped in it, than the saline substance contained in the cloth coagulates that part of the colouring matter which lies in immediate contact with it; and as all the fluid successively comes into contact with it, the whole of the colour is by degrees coagulated and deposited on the cloth.

⁴ Hypotheses concerning the adhesion of the colour.

To account for the strong adhesion of the colour to the dyed cloth, several hypotheses have been formed. One is, That the fibres of wool, silk, &c. are hollow tubes; that the colouring matter enters them; and, after being there coagulated, shows itself through the fine transparent sides of the tubes.—Another considers these filaments as solid lengthwise, but having all round their sides an infinite number of small pores like the extremities of the fine absorbing and exhaling vessels of the human body. In these pores, according to the hypothesis, the colour is lodged; and as the pores are placed exceedingly close to one another, the fine threads appear to our eyes of one uniform colour.—A third is, That the fibres are solid, or at least with respect to us may be considered as such. The saline substance, whatever it is, that is employed to make the colour strike, sinks into the surface, partly corrodes and unites itself with it into a third kind of substance no longer soluble in plain water, nor even easily by soap, but which still preserves its coagulating quality. According to this hypothesis, the dye lies entirely on the outside of the stuff, and continues as long as the effect of the salt continues upon the fibres of the matter to be dyed.

⁵ M. Hellot's theory disproved.

Concerning the truth of these hypotheses, or indeed any others that can be invented, it is impossible to bring any decisive proof. It seems, however, more probable, that the process of dyeing is accomplished by a coagulation of the colouring matter itself, rather than by any agglutination of it to the fibres by means of a vitriolated tartar, as Mr Hellot supposes. According to this gentleman's theory, a vitriolated tartar is generated in every process for dyeing, and proceeds from the acid of the alum and alkaline basis of the tartar used in the preparations, or in some of the dyeing ingredients themselves. He supposes that the pores of the stuff are cleaned and enlarged by the preparatory salts, and by the boiling water, in such a manner as to

receive the colouring particles, which particles are afterwards detained by the contraction of the pores occasioned by cold; and further, that these pores are lined with a saline crust of tartar or vitriolated tartar.

On this theory the translator of the Chemical Dictionary has the following observations. "Mr Hellot has not shown that pure fixed alkali is incapable of producing the effects which he attributes to his tartar and vitriolated tartar; and both these salts, though they are difficult of solution, and require a great quantity of water for this purpose, will yet dissolve at last; and therefore, if the colouring particles were fixed chiefly by means of these salts, they might be washed out by a large quantity of water; which we find to be contrary to experience.

"We shall find it more difficult to substitute a true theory than to refute that of Mr Hellot. Many experiments ought to be previously made. Nevertheless, it may be observed, That the colorific particles of most substances used in dyeing seem to be insoluble in water, in spirit of wine, and even in alkaline lixiviums: that their diffusion through these liquids is caused merely by their adhesion to certain gums and resinous particles; and that they may be disengaged from those gummy and resinous matters, by applying a piece of stuff to which they have a greater adhesive power, which seems to be the case of the root-coloured and blue dyes; or by applying another substance to which these particles have a greater power of adhesion; such as the earth of alum, in those dyes where that salt is used, together with some other substance, as fixed or volatile alkali, capable of decomposing alum; or as the ferruginous earth of the green vitriol in black dyes, to which the colorific particles of the galls adhere; which earths are capable of applying themselves and of adhering to the stuffs. The separation of the colouring particles from the gummy and resinous matters is probably facilitated by the addition of acids and neutral salts, which may coagulate in some measure the vegetable matters, and leave the colorific particles disengaged; so that they may apply themselves to the stuff, or to the earths above mentioned."

In a treatise on this subject by M. de Apligny, the nature of the different substances usually subjected to this operation is particularly considered. These are wool, silk, cotton, and linen. Wool was probably the first substance to which any kind of dye was applied, and which might probably have been done even in the fleece, while mankind, in their rude state, wore the skins of animals. When some further progress in arts was made, and the method of manufacturing wool into worsted and cloth discovered, the dye would then be applied to it; but it was not till a considerable time afterwards that silk and cotton were known; and the art of dyeing linen is mentioned as a new invention even in the time of Pliny.

Wool, according to our author, consists of tubes, which, like hair, contain a medullary substance, but throughout their length are sieves with an infinite number of lateral pores; and in proportion to the greater or lesser number of these pores, the woolly fibres are more or less curled. The reason assigned for this is, that "the more interruptions there are in the continuity of any body, the more flexible it will be: the fibres of the wool therefore being curled must have

many pores, and consequently great room for the extraneous substance which may be not only lodged in the exterior pores, but even penetrate into the whole extent of the tubes, after the medullary substance has been expelled. It is not therefore to be wondered at, if wool, being of all substances that are made into stuffs the most porous, should be the most easy to dye, and imbibe the greatest quantity of colour."

Silk, according to our author, may naturally be supposed to proceed originally from the mucilage of the mulberry leaf on which the animal feeds, and which he imagines is converted into an animal substance by a combination with volatile alkali; but which, by the evaporation of a thin oil, and part of its alkaline matter, becomes tough and hard. An example of something similar to this is observed on the leaves of the *ros folia*, on which there are found some drops, which being touched while the sun shines upon it may be drawn out into fine and very white threads. The consolidation of the silk is also promoted by a yellow substance with which the animal impregnates the thread; and this seems to be a concrete oil something similar to wax. Silk thread therefore is nothing else than a continued series of molecule of this indurated gluten; but as in this delication the molecule will remain at unequal distances, there will necessarily be inequalities, and consequently pores in the thread; but as these pores are only on the surface of the thread without any interior concavity as in the wool, it follows, that silk can admit no particles into its pores, but such as are extremely subtle and in very small quantities; that even the particles admitted require a stronger mastic or fixing substance than wool, since they are only superficial, and incapable of penetrating. Hence silk is much more difficult to dye permanently than wool, and requires likewise a much greater quantity of colouring materials; two ounces and a half of cochineal being required to give the same shade to a pound of silk that one ounce will give to a pound of wool. For the same reason also the colours on silk are less permanent than on wool.

Cotton being a true vegetable substance must necessarily have its fibres hollow like wool, that the juices may circulate properly; but as these are a great deal finer, the cotton is therefore much more difficult to dye. The exterior and lateral pores of cotton are likewise filled with a kind of oil, which it is necessary to expel before the dye can be given.

Flax may likewise be supposed porous, but that its pores are much smaller than those of any of the substances already mentioned. The detached and separated fibres resemble silk in some degree, only that, being more dry and compact, they take the dye with still more difficulty than even cotton; and from the different textures of these substances we may reasonably ascribe the different shades which are taken by them even when the same dyeing ingredients are made use of. This holds good also with respect to stuffs differently manufactured, though of the same kind; the pores being necessarily contracted by certain kinds of fabrication, whence they receive a smaller quantity of the dye; and hence scarlet cloth, when cut, appears white internally, the colouring atoms being too large to penetrate it, which, however, does not happen in the stuffs which have been previously dipped in solution of alum.—A difference of shade will also be oc-

casioned by the different positions and delicacy of the fibres of the stuff; and by this also a difference is made in the brightness of the colour.

With regard to the operation of those substances commonly made use of for fixing the dye, our author remarks, that lime seems delineated by the Author of nature for binding and uniting the two seemingly opposite substances of salts and earth. "Fire (says he) makes it soluble in water, and therefore easily used; but it again becomes indissoluble by the contact and influence of the air; and these properties render it capable of forming, when united to other bodies, an unalterable cement." We know several mixtures of this kind, of which lime is the basis, and that in consequence of these properties it confirms the solidity of many colours.

Alum has the property of attracting the colouring particles of the dye as well as of fixing them; and Pliny informs us that this property was known to the ancients. They made use of certain earths of the argillaceous kind, which they called *creta argentiaria*, *fulminifia*, and *anularia*, to imbibe the colour from infusions of dyeing ingredients; and they became much sooner saturated with the colour than wool itself. There are two kinds of alum made use of in dyeing, viz. *roch alum* and *Roman alum*. The first is always used for blues and the colours inclining to black; but as this generally contains some particles of iron, the Roman alum is preferred for the more lively colours, as it contains nothing capable of tarnishing their beauty. The colours are brightened by the whiteness of the earth, while its tenacity, produced by some kind of mactuosify with which it is combined, makes it more solid; and the plastic quality of the earth makes it take the form of the pores in the substance to be dyed; whence a greater permanency of colour must necessarily ensue.

There are several other saline substances made use of in dyeing, particularly nitre, sea-salt, sal ammoniac, and tartar, &c. By the three first the red colours are always rendered more dark-coloured, while the others enliven the colour and give it an orange hue. Neutral salts with a metallic basis serve to strengthen the colour, which varies its shade according to the nature of the metallic substance with which it is combined. Green and blue vitriol are the most commonly used in this art.

In explaining the theory of the art of dyeing, our author considers the whole as an effect of attraction; and in order to set forth this matter in a proper light, it is necessary, in the first place, to explain the conditions requisite for the action of bodies upon one another in this way. These conditions are, 1. That the attractive power be mutual in both. 2. That they should be placed at a distance from each other proportioned to the force of attraction. 3. That this force be superior to that by which the colouring matter is attracted by the water. Hence it is necessary for dyeing stuffs of any kind, that the dye should consist of small particles suspended in a liquid, in such a manner that they may be separated by a substance which has a greater affinity with these minute bodies than water. Some of these substances, however, are not attracted by the earth of alum, and these enter the pores of the cloth without its assistance; but in such as require the assistance of alum, the particles are fixed by the power of attraction, at the same time that the acid of the

8
Of the action of lime.

9
Of alum.

10
Dyeing-supposed to be an effect of attraction.

alum is softened by its combination with the principles of these particles; this acid having served merely as a vehicle for distributing equally into all the pores of the stuff that earth which it held in a state of the greatest possible divisibility.

11
Salts cannot fix the colour in consequence of their own insolubility

Our author next proceeds to contest the theory, that salts, even such as are the most insoluble, can maintain their stability in the pores of the stuff, however insoluble the salt may be in water. He observes that this insolubility, however great, could not prevent a great quantity of it from being carried off by water, and consequently the colour from being injured by the decomposition of these salts; but fixed earth, such as that of lime and alum, which from its nature obstinately retains the phlogistic principles of all colours, must necessarily produce such as cannot be destroyed but by the strongest acids.

12
Colours depend on phlogiston

Colours, in the opinion of our author, depend entirely upon phlogiston. It is well known that, by the simple addition of any salt to an oily, vegetable, and colouring substance, we may either change or totally expel its colour; because any salt, either simple or compound, destroying the combination then subsisting, a new reflection of the rays of light must necessarily take place. In such substances therefore as cannot have their colour affected by any salt, the phlogiston is most probably in the most perfect combination with the other principles. Were we thoroughly acquainted with this combination, we should be able to make perfect compositions for dyeing, similar to what artificial cinnabar is for painting; but though we certainly know the effects produced upon some kinds of oils by salts, and can decompose some colouring substances and separate their principles; we are still unacquainted with the manner in which these principles are combined; and therefore every effort of this kind has hitherto been found insufficient for the purpose.

13
Apligny's account of the action of acids and alkalies upon colouring substances.

"As the colour (says our author) depends upon the shape or figure of the constituent particles of the colouring bodies, the shade may be varied by changing their figure, but the permanency of the colour is at the same time diminished; because it is impossible to produce this change without altering the principles to which they owe their permanency; and this is the case with cochineal. The shades of its colour are easily varied by acids and alkalies."

M. de Apligny then proceeds to account for the action of acids and alkalies upon colouring substances. Cochineal is rendered darker by alkalies, and always becomes of a deep purple on adding them; and the volatile alkali is found to be more efficacious in this respect than the fixed kind. These salts he supposes to produce this effect, because they are natural solvents of animal substances; which, however, they are incapable of dissolving without combination, causing only a competition without the dissipation of any principle. This combination gives a degree of density to the colouring particles which they had not before; and thus inclines them to black, by occasioning a greater degree of refraction in the pencils of rays. Acids, on the other hand, especially those of the mineral kind, burn the oil, and absorb the phlogiston, which is the principle of all colours. By the violence of their action a part of the phlogiston and volatile alkali eva-

porates, the colouring matter becomes more rarefied, and reflects a greater number of the rays of light; whence it necessarily acquires a colour nearly yellow, and even quite so if a proper quantity be added; this being, according to our author, of all colours the nearest to white or transparency. Hence it is not customary for dyers to make any use of fixed alkali when cochineal is the colouring substance, as it would make too great an alteration in the consistence, and, by mixing with the animal oil, form a soap which would render the colour insoluble in water, and consequently of the false kind of dye; the oil already mixed with fixed alkali being no longer at liberty to combine with the earth of alum. But after the substance has been already dyed, the fixed alkali may then be used with advantage in some cases; because the colouring substance being already converted into what our author calls a *massie*, cannot be dissolved by the menstruum unless the latter be used in very great quantity.

Acids, according to M. de Apligny, are more destructive in their action than alkalies; and the oil of vitriol, formerly used, always containing some ferruginous particles, a kind of Prussian blue was formed, which rendered the colour purple rather than otherwise; and even by simple boiling in an iron vessel, the solution of cochineal always assumes a purple colour. The activity of spirit of nitre, which has been substituted in place of oil of vitriol, is so great, that it has been found necessary to give it a basis on which it might in part exhaust itself, and, by communicating part of its phlogiston, render it less greedy of the cochineal. This basis is tin, which formerly was dissolved by spirit of nitre, but now by aqua regia, which was found to dissolve it more completely. Our author's method of using this solution, however, is not by diluting it in water, and then by dipping the stuffs in it previous to their being dyed. "This preparation (says he) would not be sufficient; for by diluting with a great quantity of water, a part of the calx would precipitate and be reduced into particles larger than when dissolved in acids, especially if used alone and separate from the dye; the acid in that case not acting on the colour with sufficient force to enliven it. Only part of this solution, therefore, is added to the cochineal liquor; and the acid then abandoning the tin, and combining with the oil of the cochineal, the calx of the metal seizes the colouring matter as it precipitates, and, as Mr Hellot observes, forms a kind of lacker which insinuates into the pores of the stuff, and is there retained by a gluten given by the starch which was added to the dyeing liquor. Hence it is easy to conceive why the scarlet dye is much less solid than the crimson; the lacker being much drier than the simple colouring particles of the cochineal, is in this state nearer to the nature of the mineral colours. The oil and the animal gluten, which in the crimson dye form with the earth of alum a *massie*, are destroyed by the acid, and the starch then added is an insufficient substitute."

The same thing that has here been mentioned of cochineal applies equally to gum-lac and kermes; both of which afford a scarlet dye. The kermes, he thinks, has the advantage of being composed of finer particles, which more easily penetrate the pores of silk or cotton. Silk indeed, on account of the smallness of its pores, takes up only a part of the cochineal; but it extracts the

the whole of the colour from the cochineal, and the colour is also more fixed, probably because the flurp on which the insect is nourished communicates its adstringency, or contains a greater quantity of oil. Cotton may likewise be dyed with kermes, though cochineal cannot penetrate its pores.

But in whatever way the salts used in dyeing do act, it is certain they are capable, except in a very few instances, of fixing and giving a lustre and permanency to the colour which otherwise could never be obtained. The exception to this general rule most commonly known is that of indigo. This is a fine blue fecula produced by fermentation from the leaves of the Indian plant called *anil*. It is very difficult of solution; however, it may be dissolved by alkaline salts, concentrated oil of vitriol, orpiment, or combinations of sulphur with quicklime. If a quantity of indigo is dissolved in a fixed alkali (for volatile alkalis will not dissolve it), the solution is always green, which is the natural colour produced in all vegetable blues by the alkali: but if any piece of stuff is put into this solution, though it remains green while immersed in the liquid, the moment it comes in contact with the air, the dissolving power of the alkali is totally destroyed; the indigo is precipitated upon the cloth, resumes its native colour, and dyes the cloth blue.

The cause of this precipitation is very difficult to be investigated. Perhaps it may be owing to an attraction of fixed air by the alkali from the atmosphere, which renders the salt unable to dissolve the indigo any longer. The adhesion of the colour seems merely owing to an attraction between it and the cloth; for the alkaline salt can contribute nothing to this, but would rather have the contrary effect. Perhaps, however, the great solvent power possessed by alkaline salts, by perfectly clearing away every kind of fordes, may bring the indigo and cloth into nearer contact with each other, than when it is dissolved in any other way; and consequently the attraction will in these cases be the stronger. This seems to have some probability; for when indigo is dissolved in vitriolic acid, as in dyeing Saxon blue, the colour is much more easily discharged.

Another exception is in the juices of some vegetables, such as the nuts of the anacardium. This produces, without addition, a most deep and lasting black, never to be washed out or discharged by any means whatever. Several other plants are to be found in different parts of the world, which give an indelible black stain upon linen without addition; and the colouring matter of these seems to adhere by means of a very tenacious gluten, with which it is mixed, and which, when once thoroughly dried, can never be again dissolved. In this respect, these black staining colours seem analogous to the *purpura* of the ancients; which stained indelibly without addition, and was of an exceedingly viscous and adhesive nature.

SECT. II. *Practice of Dyeing.*

THE materials for dyeing different colours are so many and various, that an enumeration of them all is scarce to be expected. The same difference, however, takes place among the materials for dyeing which we have observed to take place among those for *Colours*.

Making. Some ingredients produce durable colours, which cannot be discharged either by exposure to the air or by washing with soap: others, though they may be made to stand the action of soap pretty well, cannot by any means be enabled to resist the action of the air. These are distinguished by the different names of *true* and *false*, *permanent* and *fading*, &c.; nor is there any method yet discovered of giving the false colours an equal degree of durability with the true ones. This hath been attempted by mixing a permanent and a fading colour together; in which case it was thought that the former would impart somewhat of its durability to the latter: but this hath always been found to misgive; the fading colour soon flying off, and leaving the permanent one behind. Nay, in many cases this does not even happen; for, by some means hitherto not accounted for, the volatile colour imparts its volatility to that which would otherwise be permanent. The same hath also been attempted by dyeing a piece of stuff partially with a fading colour, and then completing the dye with a permanent one. In this case it was hoped that the fading colour being covered over, and defended from the injuries of the air by the permanent one, would necessarily become equally durable, or at least remain a much longer time than if the stuff was dyed with it alone. But this also hath been found ineffectual; and the fading colour hath been dissipated as soon when covered with a permanent one, as when left without any such cover.—Solution of tin in aqua regia will give most of these fading colours an high degree of beauty, and some share of durability, though even that is not able to make them equal to the others.—The most permanent dyes we have are cochineal and gum lac for fine reds and scarlets; indigo and woad for blue; and, when mixed in different proportions with cochineal or lac, for purple and violet colours. Weld, and some other vegetables, for yellow; and madder for coarse reds, purples, and blacks.—The fading colours are much more numerous. In this class are included Brazil-wood, logwood, peach-wood, red-wood, fustic, turmeric root, annatto, archil, &c. &c.

With regard to the salts made use of in dyeing, it hath been but too often customary to jumble together such a quantity of different ones, that it was not only impossible to know in what particular salt the virtue resided, but often the efficacy of the whole hath been totally destroyed, and the colour entirely spoiled by such injudicious management. It is proper, therefore, where a mixture of two or more salts is intended to be made for dyeing, first to try the change of colour produced by each of the salts upon the colouring substance. If the colours are nearly alike, the mixture may be safely made as to that particular. But if the two colours produced by the different salts are very different from one another, to mix them together must be very injudicious. Thus, suppose you want to dye scarlet, solution of tin in aqua regia produces the necessary change of colour on the decoction of cochineal, and converts it into a high flame-colour, which shows it to be a proper ingredient; but to the solution of tin, it would surely be the greatest absurdity to add a quantity of saccharum saturni, the effect of which is to change the colour of cochineal to a dull purple. But though the salts taken separately should produce a colour nearly similar, another thing must be regarded, namely, whether

15
True and
false dyes.

14
Exceptions
to the general
rule concerning
salts.

16

Salts to be
used in dye-
ing.

ther they can be mixed with safety to one another? It is the nature of many salts to destroy one another whenever they come into perfect contact by being dissolved in water. Thus, solution of tin and saccharum saturni destroy one another; and so do solution of tin and tartar or cream of tartar. To mix these together must therefore be absurd; and yet we find this last mixture ordered in almost every receipt for dyeing scarlet. It is also to be observed, that a mixture of different salts ought never to be made, out of a notion that the colour will keep the better on that account; for most commonly it will keep the worse. A single salt will answer for this purpose better than a hundred. A mixture should only be made where it is necessary to produce the colour desired; and if a dyer proceeds in this simple manner, he may not only attain to great perfection in the art from his own experience without being taught by others, but even make considerable discoveries; as dyeing is at present far enough from being brought to perfection.—The salts chiefly to be used in dyeing are fixed alkalies; solutions of tin in the vitriolic and marine acids, and in aqua regia; sugar of lead; cream of tartar; alum; oil of vitriol; and solution of iron in the acetic acid. By means of these, almost all kinds of colours may be dyed at an easy rate, and with very little trouble.

17
Primitive
colours in
dyeing.

With regard to the operative part of this business, Mr. Hellot observes, that the whole depends on the use of some colours called by the workmen *primitives*, which have no relation to the colours called primitive by Sir Isaac Newton. The primitive colours used by dyers are in number five, viz. blue, red, yellow, fawn or root colour, and black. Each of these furnish a great number of shades, both according to the nature of the ingredients themselves, and the acid or alkaline substances with which they are mixed. Of these five colours only two should be prepared with ingredients which produce no colour themselves, but which, by their acidity, and the fineness of the earth they contain, dispose the pores of the substance to receive the dye. Those colours which in a more particular manner require such a preparation are the red and yellow, with such others as are derived from them. Black requires a particular preparation; but blue and fawn colour none, at least for wool; it being sufficient for the purpose to scour and soak this substance well; after which nothing more is required than to plunge it into the vat, stirring it well about, and letting it remain for a longer or shorter time as the colour is intended to be more or less deep.

18
Ingredients
used in dye-
ing blue.

The ingredients used in dyeing blue are by our author determined to be three in number, viz. *pastel*, *wood*, and *indigo*.

Pastel, called in Latin *isatis* or *glisium*, is prepared by gathering it when come to maturity, suffering it to rot, and then making it up into balls for drying. For this purpose it is cultivated in Languedoc, and is made up into balls of 150 or 200 pounds weight. These resemble a collection of little dry lumps of earth intermixed with fibres of plants. For extracting the colour, the dyer must provide himself with large wooden vats of a magnitude proportioned to the quantity of stuff to be used. Mr. Hellot recommends them from ten to twelve feet in diameter, and six or seven in height. They should be made of flaves six inches

broad and two inches thick, bound with iron hoops about two or three feet asunder. They are to be sunk in the ground for the more easy management of their contents, which is done by means of hooks fastened to the end of a staff, the length of which is proportioned to the diameter of the vat. The bottom is made of lime and cement, though it might be made of wood, were it not for the difficulty of getting a wooden bottom strong enough to support the weight. The vats used for dyeing cottons of a blue colour, as M. de Apligny informs us, are generally formed of large brandy pipes newly emptied, or of oil hogheads containing about 500 quarts. Before the latter are made use of, they ought to be well cleaned, by flaking lime in them, and scrubbing with a broom till the oily matter is thoroughly dissolved by means of the lime.

The preparation of the blue vat is the most difficult operation in the whole art of dyeing; and for this our author gives the following directions: “Your copper cauldron should be placed as near as possible to the vat, and then filled with pond-water. If the water be not sufficiently putrid, you put in a handful of hay, viz. two or three pounds, with eight pounds of brown madder, or the bark of the root. If you could have the old liquor of a madder vat, it would have fresh madder, and have a better effect. The fire should be lighted about three in the morning, and the mixture should boil an hour and a quarter; though some continue the boiling for two hours and an half or three hours. The liquor is now to be conveyed into the vat by means of a spout, the vessel being very clean, and having a hatful of wheaten bran at the bottom. The pastel balls are to be put into the vat one after another while the liquor is running into it, that they may be more easily broken, stirred, and mixed with the rake, an instrument composed of a strong femicircular piece of wood, with a long wooden handle. The mixture should be continually stirred till all the hot liquor is emptied out of the copper into the vat; and when the latter is rather better than half full, it should be covered with a lid a little larger than the circumference. There should also be a cloth put over it, to confine the heat as much as possible; after which the whole should be allowed to remain four hours. It ought then to be uncovered, in order to mix it thoroughly, and to give it air. About an handful of lime ought now to be put in for every ball of pastel; and after scattering in this substance, the vat should again be mixed and covered as before, except about an handbreadth to let in the air. In four hours after it should again be stirred, but without giving it any more lime; then it is to be covered and suffered to stand for three hours longer, leaving a small opening for air as before. At the end of three hours it may again be uncovered and well stirred; and if it be not yet ready and *come to*, according to the language of the dyers, that is, if the blue does not rise to the surface, but that it still foams, which may be known by striking with the flat of the rake, it will be necessary, after stirring it well, to let it stand an hour and an half longer, watching it carefully during that time in case it should cast blue. You then supply it with more water till the vat is full, putting in as much indigo as you think proper.

“The indigo used for this purpose should be in solution; and in order to dissolve it you must have a separate

19
Prepara-
tions of the
blue pastel
vat.

parate cauldron and furnace, and the vessel sufficient for dissolving 80 or 100 pounds of indigo must contain 30 or 35 buckets of hard water. This should be made into a lixivium, by putting 25 buckets of clear water into the copper with the addition of a hatful of bran, 12 or 13 pounds of madder, and 40 of good pot-ash; that is, half a pound of alkaline salt and two ounces and a half of madder to each pound of indigo. It should boil quickly for three quarters of an hour; after which the fire should be taken away from the furnace, and the residuum stand for half an hour, in order to let the sediment fall to the bottom. The clear liquor is then poured into a clean cask placed close to the copper. Take out the grounds at the bottom of the copper, wash it clean, return the lixivium into the copper, light a small fire under it, and at the same time put into the copper 80 pounds of indigo reduced to a gross powder. The liquor should then be made very hot, but not suffered to boil; and to facilitate the solution, it must be kept continually stirring with a small rake, to prevent it from gathering into lumps, or from burning to the bottom of the copper. The liquor should be kept moderately hot, and of as equal a degree of heat as possible, by throwing into it from time to time some lixivium of lime, which should be at hand ready prepared, in order to cool it. As soon as you perceive that there are no longer any lumps in the bottom of the copper, and that the indigo is well dissolved and diluted, the fire is to be withdrawn from the furnace, leaving only a few hot cinders to keep it warm. Cover up the copper then, and put in a pattern of stuff, which ought to be green when taken out, and turn blue immediately on being exposed to the air. Should this not be the case, some fresh and clear lixivium, prepared as just now directed, must be added.

"In preparing the pastel-vats, one common dye-house kettle full is to be put in for every ball of pastel; the vessel is then to be filled within six fingers breadth of the edge, when it is to be well mixed and covered as before.

"An hour after the vat has been supplied with water, it must have two measures (about two handfuls) of lime for every ball of pastel, or in proportion as it is thought that it will be required; but as some kinds of pastel require much less preparation than others, it is impossible to give any accurate directions upon the subject. In general, however, the lime should not be scattered in till the vat be well stirred.

"Having again covered the vat, a pattern is to be put in at the end of three hours, which should also be kept three hours immersed in the liquor, when it is to be taken out, in order to examine the state of the vat. The pattern, as has already been observed, ought to be green when immediately taken out, but instantly to turn blue; and if it is of a good green, you stir the vat, adding one or two handfuls of lime, and then cover it. Three hours afterwards it is to be stirred again, adding more lime if necessary. Cover it then for an hour and an half longer; and when the matter is settled immerse a pattern, which must remain for an hour, and then be inspected to know the state of the pastel. If the pattern be of a good green when taken out, and becomes a deep blue when exposed to the air, another pattern is to be put in, in order to ascertain the effect of the vat. Should the colour of the pattern be suffi-

ciently high, the vat is to be filled with hot water, or, if it can be procured, the liquor of an old madder vat, and then stirred again. If the vat wants lime, a sufficient quantity must be added according to the smell, and as it may be found necessary during the working. This being done, and the vat brought to a proper state, it is to be once more covered for an hour; after which the stuffs are to be immersed in it."

This operation is supposed by some dyers to be impracticable, except upon a very large scale; but M. Hellet has made some experiments on this subject, which seem to evince the contrary. For this purpose he took a little barrel containing about 25 gallons, and put it into a copper full of water kept carefully heated. He then put 10 gallons of water into a small copper with an ounce and a half of madder, and a very small handful of dyer's weed; which last, however, he does not suppose to be of any use. Having made the whole to boil together for three hours, he poured all the liquor into the barrel about nine in the evening, previously putting into it two small handfuls of bran. At the same time he added four pounds of pastel; and having stirred it well for a quarter of an hour, he covered it up, and took care to have it stirred every three hours during the night. It is customary to put some four water into the large vats, but this was omitted in the present case; and the bran, which fouled with the liquor, was found to be a sufficient substitute. Next morning the mixture was found to be in a state of fermentation, frothing up and making an hissing noise. On mixing it well, and adding an ounce and an half of slaked lime, the froth was increased; and as the smell became stronger, it was judged proper to add a little more pastel. At half an hour after ten the vat smelt stronger of the lime; a pattern was put into it; and at the expiration of an hour, it was taken out green; and which, on being exposed to the air, became blue. On being stirred, another pattern was put in about an hour afterward; which having also remained an hour immersed in the liquor, came out afterwards of a deeper blue than the former. At half an hour after twelve two ounces of indigo, not dissolved, but only powdered, sifted, and diluted with hot water, were put in, with about the bigness of a walnut of the *cendres gravelles* or burnt lees of wine, which contain a large quantity of alkaline salt; and every two hours afterwards a pattern was put in an hour after stirring the vat, letting each also remain an hour in the liquor. This was continued till ten o'clock; and the last patterns were not only evidently darkest, but of the brightest colour.

The last pattern showed that the lime was exhausted; but on account of the lateness of the hour, our author added only another half ounce of lime, and an hour after put in another pattern; which after having remained an hour in the liquor, was taken out more blue than the rest, though the colour had been rendered less lively by the lime. Two other patterns put in during the night were still darker, though the colour was somewhat dull; an evidence that the lime was not yet exhausted. The paste which lay at the bottom was of a yellowish brown when taken out, but by exposure to the air became of an olive green. Under the surface it appeared of the same colour if moved with the hand, but instantly became green, smelling rather strong, though not very much of the lime. The liquor

such

itself was of the colour of beer, but the scum or froth of a blue colour. Patterns were now put in every two hours till two in the afternoon; when that which was taken out appeared of such a fine blue, that it was judged proper to fill the vat. For this purpose about eight gallons of water were put into a little copper with a quarter of an ounce of madder and a handful of bran; and when it had boiled for half an hour, the liquor was put into the little vat for three hours. On stirring and letting it then remain for an hour afterwards, a pattern was put in, which in an hour's time was taken out of a beautiful blue. An ell of serge was then immersed by means of what our author calls a *crofs*; which is an iron loop with a net fastened to it, the meshes of which are about an inch square; and the whole may be suspended at any height required by means of three or four cords fastened to it. The serge had no other preparation than being made thoroughly wet; nevertheless, in about a quarter of an hour it was taken out very green, and on being wrung out turned blue; but on a second immersion for another quarter of an hour, the colour turned out much more lively and brighter than could have been expected. The experiment was repeated with a pound of worsted; but the vat had been so much exhausted that it came out only a skye blue; however, by sprinkling in about half an ounce of fresh lime, the colour was afterwards made sufficiently deep.

21
His direc-
tions for
working
the pastel
vat.

For working this vat our author gives the following directions. 1. It is in a proper state for working, *i. e.* for imparting the blue colour to the stuffs put into it, when the sediment or grounds at the bottom is of a fine brown green; when it changes upon being taken out of the vat; when the froth which rises to the top is of a fine Persian blue; and when the pattern, which had been steeped for an hour, is of a fine green colour. 2. The vat is also in a proper state for working, when the liquor is clear and reddish, and the drops which adhere to the rake are of a brown colour. 3. When the liquor is neither harsh nor too greasy to the feel, and when it smells neither of lime nor of the lixivium. 4. It may be known when too much lime has been put in, by the colour of the pattern immersed in the liquor; which, instead of being a fine grass green, will be only a dirty greyish blue, or some other colour of that kind. The same thing may likewise be understood when the sediment does not change colour; when there is scarce any efflorescence on the vat; and when the liquor smells only of lime or lixivium.

In order to rectify the state of the vat in this case, several methods have been recommended by practical dyers. 1. Some use tartar or bran, adding a quantity of either as occasion may require. 2. Others attempt to correct it by throwing in a bucket of urine. 3. Sometimes they use a large iron stove, which may reach from the grounds at the bottom to the top of the vat.—This machine is furnished with a grate about a foot from the bottom, and an iron funnel, one end of which commences with the grate, and communicates with the external air. On forcing down the stove to the bottom of the vat, where it ought to be retained by iron bars, the heat of the stove will force up the lime to the top, where as much as is required may be taken out by a sieve. 4. Some

dyers correct a vat which has got too much lime with urine and tartar: but the best method, according to our author, is to put into it a sufficient quantity of bran and madder; and if the excess of lime is not very great, it may be allowed to stand four, five, or six hours, or more, adding to it two handfuls of bran and three or four pounds of madder, which should be slightly sprinkled on the top without any covering. At the end of four or five hours it should then be stirred by a rake, and a pattern put in to try the effect of it. If the blue does not rise until it be cold, it ought to have time to recover, by allowing it to stand without disturbance, which sometimes requires whole days to accomplish; but, in general, the lime which seems to want strength to carry on the fermentation, revives and prevents the vat for some time from yielding any colour. To bring it forward, some bran and madder should be sprinkled on the top, besides an addition of two full baskets of fresh pastel, which affixes the liquor, when heated again, in dissolving the lime. 5. The vat ought now to be frequently tried by putting in a pattern, that from one hour to another you may be able to judge by the green colour how far the lime has operated. Thus the operation may be accurately conducted; for when the vat has suffered either by too much or too little lime, it is very difficult to manage it. 6. If, during the time that you are thus employed in retrieving the vat, it should cool too fast, you must endeavour to preserve the heat by emptying some of the liquor, and replacing it with hot water; for when the liquor grows cold, neither the pastel nor lime are consumed but in very small quantity. The action of the lime is also retarded by too great a degree of heat; and in this case it is proper rather to wait a little than to be in too great a hurry to restore the vats. 7. It is evident that the vat has suffered by not being sufficiently supplied with lime, when there are no large air-bubbles on the top of a fine blue colour, but only a settled froth of small tarnished bubbles; and when, by dashing upon the surface of it with the rake, it makes a hissing noise produced by the breaking of a vast number of these small air-bubbles as soon as they are formed. The liquor has also an offensive smell like rotten eggs, and the sediment does not change colour when taken out of the liquor. This accident will very probably take place, if you do not carefully attend to the smell of the vat, but imprudently put in the stuffs when the pastel has spent the lime; for in that case the small quantity of lime which remains will adhere to the stuffs, and will thus give them a bad colour. When this is perceived, you must immediately take them out, and add three or four handfuls of lime in proportion to what you suppose the vat has suffered, but without stirring it up from the bottom. On stirring the vat you ought to attend to the noise as well as to the smell; for if the hissing ceases, and the bad smell is also removed, there are great hopes that the liquor only has suffered, and that the pastel is not impoverished. But when the liquor smells of lime, and is soft to the feel, the vat is then to be covered, and allowed to settle for an hour and an half; after which period, if the efflorescence commences, a pattern is to be put in, and the subsequent process is to be regulated by the colour it assumes.

Some are of opinion that the pastel blue is much superior

superior to that obtained with a mixture of indigo; but it is undoubtedly much dearer, as yielding a much smaller quantity of colour: and from the experiments of M. du Fay, as well as of our author on this subject, it appears that the prejudice in favour of pastel is by no means well founded. When a vat has been heated and well worked two or three times, the same colour is frequently preferred, only taking out part of the sediment, and supplying it with fresh pastel; but for this no directions can be given, as it is evident that the whole must be regulated by the practice of the dyer. Some are accustomed to allow the same liquor to remain for years in their vats, only supplying it with ingredients from time to time; but this practice seems not to meet our author's approbation, who thinks it rational to suppose that the best colours will be made by emptying the vats entirely when they have been heated six or seven times, and cease to give any more colour.

22
Danger of
reheating
pastel vat
when the
lime is ex-
hausted.

With regard to the reheating of the pastel vats, our author further observes, that if you heat a vat when it is exhausted, viz. when deficient in lime, it will imperceptibly turn in such a manner as to be in danger of being spoiled; because the lime, already too much diminished, will be entirely consumed by the heat. The only remedy, if discovered in time, is to throw it back into the vat, to supply it with lime, and then wait till it recovers before you reheat. In this operation also care should be taken to put the grounds into the copper with the liquor; and it must not be allowed to boil, otherwise some of the more volatile parts necessary for producing a good colour will be evaporated. Some do not put the indigo into the vat until some hours after the liquor has been emptied out of the copper, and the mixture begins to recover itself. This precaution is taken lest the vat should not recover, and then the indigo would be lost. An inconvenience, however, arises from this practice, viz. that the indigo does not give out its colour freely; so that it is best to put it into the vat immediately with the liquor, and to stir it well afterwards. If a vat that has not been worked is to be reheated, it must not be skimmed as in the common operations of this kind, for then the indigo would be skimmed off; but in ordinary cases the scum is composed of the earthy particles of the indigo and pastel, with a small quantity of lime. When too much lime is added, you must wait till it be consumed. It might indeed be corrected by an addition of acid or other ingredients; but as these also consume the colour, it is better to wait the natural operation of the lime itself. Weak lime proves likewise disadvantageous, because it remains in the liquor without incorporating with the paste. When this is the case, the paste smells strong, and the liquor has a kind of sweetish smell; but both ought to be alike in this respect. The remedy is to hasten the solution by stirring it often in order to mix the lime with the paste, till the proper smell of the vat be restored, and the froth on the surface becomes blue.

23
To slack
lime for the
purposes of
dyeing.

To slack the lime for the purpose of dyeing, several pieces are to be thrown into water one after another, taking out each piece when it begins to ferment, and putting in another. It is then put into an empty copper or other vessel; and when fallen thoroughly

into powder, it is to be sifted through a fine sieve, and kept in a very dry cask.

In this operation acid waters are sometimes necessary; the method of preparing which is as follows: Fill a copper of any size with river water; put fire under it; and when it boils, throw it into a cask in which you had before put a sufficient quantity of bran. It should be well stirred three or four times a-day. Three bushels of bran into a vessel containing about 70 gallons of water have been found to answer the purpose. This water, at the end of four or five days, becomes acid; and therefore may be applied in all cases where it does not injure the preparation of the worsted. It must be observed, however, that woollen fleece, by too great a quantity of acid liquor, would be rendered difficult to spin, as being in a manner glued together by the matter proceeding from the bran. It is also necessary to take notice, that the acid must not be left in the cauldron, especially if this is made of copper; because it will corrode enough of the metal to occasion a deficiency in the colour. This metal, when dissolved, gives a greenish colour.

The Dutch vats are constructed in such a manner as to require less frequent heating than those above described. The upper part of them for three feet downward is of copper, and they are almost surrounded by a brick wall at about the distance of six or seven inches from the metal. A quantity of hot embers are deposited in this interval, which maintain the heat of the vat so effectually, that it remains for several days in a state fit for working even after it becomes very weak. This is not the case with the others, which frequently give a much deeper colour than was intended, unless you suffer them to grow considerably colder; and in that case the colour is less bright.

The woad-vat differs from that already described only in being weaker and yielding less colour; but it is prepared in the same manner. The following is a description of the woad vat, according to an experiment made by M. Hellot, similar to that concerning the pastel already mentioned.

"I placed (says he) in a cauldron a small cask containing about twelve gallons, two-thirds full of river-water, an ounce of madder, and a small quantity of weld; at the same time I put into the cask a good handful of bran and five pounds of woad. At five o'clock in the evening the vat was well stirred and covered. It was again stirred at seven, at nine, at twelve, at two, and at four. The woad was then working, as has been already observed with regard to the pastel. Some air bubbles began to rise pretty large, but in a small quantity, and of a very faint colour. It was then garnished with two ounces of lime, and stirred. At five o'clock I put in a pattern which I took out at six, and again stirred. This pattern had received some colour. At seven o'clock I put in another, and at eight stirred again. This pattern was tolerably bright: I then added an ounce of indigo; at nine o'clock another pattern; at ten stirred again, and put in an ounce of lime because it began to smell sweetish; at eleven another pattern, and at twelve stirred again. This process was continued till five o'clock. I then added three ounces of indigo. At six I tried another pattern, and at seven stirred again. It would have been now time to fill it, being in a proper state

24
Prepara-
tion of acid
waters.

25
Construc-
tion of
Dutch vats;

26
Of the
woad-vat;

for working, as the last pattern which had been taken out very green became a bright blue : but as I was very much fatigued, having sat up the whole night, I chose to defer it till the next day, in order to see its effect by day-light ; and for this reason I added an ounce of lime, sufficient to sustain it till nine o'clock in the morning. Patterns were put in from time to time ; and the last being very beautiful, I filled the vat with a liquor composed of water and a small handful of bran only. It was then stirred, and patterns tried every hour. Being in a proper state at five o'clock, it was immediately worked. It was then garnished with lime, and mixed, in order to preserve it till such time as it might be convenient to re-heat.

“ Two months afterwards I prepared another woad vat without indigo, that I might be enabled to judge of the solidity of the dye ; and was convinced, by experiment, that it was of equal goodness with the pastel. Hence the pastel is superior to the woad only because the latter yields less colour than the other.

“ The little variations to be observed in the method of setting these different vats, sufficiently demonstrates that there are many circumstances in the several processes not absolutely necessary. In my opinion, the only matter of importance, and which demands attention, is to conduct the fermentation with caution, and to avoid supplying with lime till, from the indications I have described, it appears necessary. With regard to the indigo, whether it be added at twice or all at once, whether a little sooner or a little later, is, I think, of very little importance. The fame may be said of the weld, which I used twice, and twice omitted ; and likewise of the pearl-ash, a little of which I put into the small pastel vat, and omitted in that of the woad. In short, it appears to me very demonstrable, that the distribution of the lime either in the setting or reheating the vats requires much attention. It must also be observed, that in setting either a pastel or woad vat, it cannot be too frequently examined ; because though some are too slow, which is attributed to the weakness of the pastel or woad, others become too soon ready for working. I have seen seventy pounds of pastel lost by this neglect. It was ready for working at eight o'clock, but for want of the workman's constant inspection, he did not discover it till two hours afterwards. The paste was then entirely risen to the surface of the liquor, which smelt very four. It was now impossible to recover it ; he was therefore obliged to throw it out immediately, or it would very soon become insupportably putrid and fetid.

“ This difference in the vat may be also produced by the temperature of the air, as it cools much sooner in winter than in summer. It is therefore necessary to watch very attentively, though it is seldom fit for working in less than 14 or 15 hours.

“ The indigo vat (says our author) is about five feet high, two feet in diameter, and grows narrower towards the bottom, being surrounded by a wall, and a vacancy left for the embers. In a vat of this size you may put from two to five or six pounds of indigo. In order to set a vat containing twenty gallons, you boil in a copper about fifteen gallons of river-water for half an hour, with two pounds of pot-ash, two ounces

of madder, and a handful of bran. The indigo is prepared mean while in the following manner :

“ Take two pounds of indigo, and put it into a pail of cold water, in order to separate the solid from the volatile particles, which will immediately rise to the surface. The water is then poured off, and the remaining indigo pounded in an iron mortar ; you then put a little hot water into the mortar, shaking it from side to side, and pouring into another vessel that which swims, and which is consequently the best bruised. In this manner you continue to pound what remains in the mortar, still adding fresh water, in order to make the finest part rise to the surface, and so on till all the indigo is reduced to a powder so fine as to rise in the water, which is all the preparation required. The liquor which had boiled in the copper, with the grounds of the madder and pot-ash, which probably fell to the bottom, is thrown into the high narrow vat ; at the same time adding the pounded indigo. The whole is then well stirred with a rake, the vat covered, and the embers put round it. If this operation was begun in the afternoon, you must renew the hot embers in the evening, which should also be repeated both morning and evening the next day : the vat should be lightly stirred twice the second day. In order to maintain the heat of the vat, you renew the embers on the third day, stirring the vat twice. You then perceive, that a shining brassy scum, divided and interrupted in many places, begins to rise on the surface. By continuing the heat, on the fourth day the scum becomes more perfect and less broken. The froth that rises upon stirring is now blue, and the vat a deep green.

“ When it becomes green in this manner, it is an indication that the vat should be filled. For this purpose you must prepare a fresh liquor, by putting five gallons of water into a copper, a pound of pot-ash, and half an ounce of madder. When this has boiled a quarter of an hour, you fill the vat. You then stir it ; and if it produces much froth, it will be in a proper state for working the next day. This is sufficiently known by the quantity of froth, and by the brassy scaly crust that swims on the top of the liquor ; also when, by blowing or stirring it with the hand, the liquor beneath is green, though the surface appears of a brown blue.

“ This vat, of which I have just described the process, and the first I had set, was much longer in coming to a colour than the others, because the heat was too strong the second day ; but for this accident, it would have been ready for working two days sooner. It was attended with no other bad consequence ; and therefore, as soon as it was in a proper state for working, I dipped at several times 30 or 40 pounds of serge. As the liquor was by this means diminished and weakened, it was necessary in the afternoon to replenish with a fresh mixture, composed of a pound of pot-ash, half an ounce of madder, and a handful of bran. Having boiled this a quarter of an hour, it was put into the vat ; which was then stirred, covered, and a few embers put round it. In this manner it may be kept for many days ; but when you mean to work it, it should be stirred the preceding evening, and supplied with hot embers.

“ When

"When you would reheat this kind of vat, and replenish it with indigo, you put into a copper two-thirds of the liquor, now no longer green, but of a brown blue and almost black. When it is ready to boil, the scum on the top should be taken off with a sieve; after which it should be suffered to boil, with the addition of two handfuls of bran, a quarter of a pound of madder, and two pounds of pot-ash. The embers are then taken from under the copper, and a little cold water thrown in to stop the boiling. It is then emptied into the vat, with the addition of a pound of indigo pulverized and dissolved in some of the liquor, as I have said above. The vat being then stirred, covered, and a few hot embers put round it, will be fit for working the next day.

"When an indigo vat has been reheated several times, it should be emptied out entirely and set anew, because the colour becomes dull: for though heated, and in a proper state for working, the green colour is not so beautiful as at the beginning.

"I have had several other vats let in the same manner, with a greater or less quantity of indigo; as from one to six pounds, proportionably increasing or diminishing the other ingredients; always, however, putting a pound of pot-ash to a pound of indigo. From other experiments which I have since made, I am convinced that this proportion was not absolutely necessary. I am also persuaded that there are many other methods for the preparation of the indigo vat equally effectual. I shall nevertheless make some observations concerning this vat.

"Of all those which I have had prepared in this manner, I failed but in one; which was occasioned by neglecting to put hot embers round it on the second day. I added some pulverized arsenic, but without any effect; it would never come to a colour. Red-hot bricks were also thrown into it at several times; the liquor at times became greenish, but never sufficiently. At length, after having to no purpose tried several other means without being able to discover why it did not succeed, and having reheated it several times, I had it thrown out at the fortnight's end.

"The several other accidents which I met with in the conduct of the indigo vat only retarded the success; so that this operation may be considered as very easy in comparison of the pastel or woad vat. I have indeed made several experiments on each of them, with an intent to shorten the time of the preparation; but for the most part not succeeding, or at least not better than by common practice, it is needless to describe them.

²⁹ Differences between the pastel and indigo vats. "The liquor of the indigo vat is not in every respect like that of the pastel. Its surface is a brown blue, covered with coppery scales, and the liquor itself of a fine green. The stuff or woollen which it dyes is green when taken out, and becomes blue immediately afterwards. The same observation has been made with regard to the pastel vat, but it is very singular that the liquor of the latter is not green, though it produces the same effect upon woollens as the other. It is also necessary to observe, that when the liquor of the indigo vat is changed out of the vessel, and too long exposed to the air, it loses its green colour, and at the same time all its qualities;

so that, though it yields a blue colour, it is not permanent.

"There is likewise a cold preparation of an indigo vat ³⁰ Cold indigo with urine, and it is also worked cold. For this purpose, you take four pounds of indigo powdered, and put it into a gallon of vinegar, leaving it to digest over a slow fire for 24 hours. At the expiration of this time, if it be not perfectly dissolved, it is again pounded in a mortar with the liquor, adding now and then a little urine. You afterwards put into it half a pound of madder, mixing it well by stirring the whole with a stick. When this preparation is finished, you pour it into a cask containing 60 gallons of urine: it is of no consequence whether it be stale or fresh. You mix and stir the whole well together; and this should be repeated morning and evening during the space of eight days, or till the surface of the liquor becomes green when stirred, and produces froth like the common vats. It may be worked immediately without any other preparation than stirring it three or four hours before hand. This kind of vat is extremely convenient; because when it is once prepared, it remains for always till it is entirely exhausted, that is to say, till the indigo has yielded all its colour: hence it may be worked at all times, whereas a common vat must be prepared over night.

"According as you would have this vat more or less considerable, you augment or diminish the ingredients in proportion to your quantity of indigo: thus for every pound of indigo you always put a quart of vinegar, two ounces of madder, and fifteen gallons of urine. This vat is much sooner prepared in summer than in winter. If you would hasten it, you need only take a little of the liquor, heat it in a copper without suffering it to boil, and afterwards pour it into the vat. This operation is so very simple, that it is almost impossible it should fail.

"When the indigo is entirely exhausted, the vat may be renewed by dissolving some fresh indigo in vinegar; but you must add madder in proportion to the quantity of indigo, and then pour it into the vat, which should be stirred as at first morning and evening: it will be as good as if it were fresh. This, however, should not be repeated more than four or five times; because the grounds of the madder and indigo would tarnish the liquor, which would consequently render the colour less bright. I must however confess, that as I have not myself experienced this vat, I cannot answer for its success: but the following with urine, which I have seen prepared, dyes woollens a very permanent blue.

"A pound of indigo was first steeped in a gallon of urine for 24 hours; it was afterwards ground in a large iron mortar with the same urine. When by this means the urine became very blue, it was strained through a fine sieve into a small tub; but the indigo which remained in the sieve was beaten again in the mortar with another gallon of fresh urine, and this was repeated till all the indigo passed through the sieve with the urine. This operation, which continued two hours, being finished, about four o'clock in the evening 62 gallons of urine were put into a copper, which was made very hot, but without boiling; and the scum which rose on the surface of the urine was brushed off the copper

³¹ A hot vat with urine.

with a beſom. This was frequently repeated till nothing roſe but a ſlight white ſcum. The urine being thus ſufficiently purified and ready to boil, it was thrown into the wooden vat; the prepared indigo was then added, and the vat ſtirred with a rake, in order that the indigo ſhould incorporate with the urine. Immediately afterwards a mixture, conſiſting of a gallon of urine, a pound of alum, and a pound of red tartar, was added to the vat; but theſe were firſt reduced to a fine powder. The urine was then poured out on it in the mortar, and mixed together till it ceaſed to ferment. It was then poured into the vat, well ſtirred, and covered. In this ſituation it was left all night. The next morning the liquor was very green. This ſhewed that the vat was in a proper ſtate, and that it might have been uſed; but it was ſuffered to remain without working, becauſe all that had been hitherto done was only the firſt preparation of the vat, and the indigo which had been put into it was deſigned only to nourish and temper the urine. Hence the vat was ſuffered to reſt two days in order to complete the preparation, but covered all the time to prevent it from cooling too faſt. It was then managed as follows: A ſecond pound of indigo was beaten with purified urine as above. About four o'clock in the afternoon the whole vat was emptied into the copper: it was then made very hot, but not boiled. It ſtill produced a thick ſcum, which was taken off; and the liquor, being near boiling, was returned into the vat. The indigo was immediately added, bruised as above, with a pound of alum, a pound of tartar, and two quarts of urine, with the addition of another pound of madder: it was then ſtirred, cloſe covered, and ſuffered to remain fo all night. The next morning it was in very good order; the liquor being very hot, and of a beautiful green: hence it was evidently in a proper ſtate for dyeing; which was executed in the following manner. The ſubſtance to be dyed was woollen fleece.

“ This fleece had been well ſcourd with urine, well waſhed, and perfectly well drained. Being thus prepared, 30 pounds of it were put into the vat. It was then well opened with the hands, that it might be equally drenched; and after this it was ſuffered to remain an hour or two according to the degree of ſhade that was required. During this time the vat was kept cloſe covered, in order to preſerve the heat; for the hotter it is, the better it dyes: when it becomes cold, it ceaſes to act. When the wool was ſufficiently blue, it was taken out in large balls, as big as a man's head; and at the ſame time ſqueezed and wrung over the vat, and immediately given to four or five women who ſtood round the vat, in order to open it, and expoſe it to the air between their hands till the green colour which it had coming out of the vat changed to blue. This change was produced in three or four minutes. Theſe 30 pounds being thus dyed, the vat was raked, and then ſuffered to ſtand for two hours, keeping it always cloſe covered. At the expiration of this time they put in another 30 pounds of wool, which was opened well with the hands. The vat was again covered; and in four or five hours this wool had taken as good a colour as the former: it was then taken out of the vat in balls in the ſame manner as the former. This operation being finiſhed, the vat was ſtill warm,

but not ſufficiently ſo to dye any more wool; for when it has not a ſufficient degree of heat, the colour which it yields will be neither uniform nor ſolid: hence it is neceſſary to reheat and replenish with indigo as before. This may be done as often as you think proper; becauſe this vat never ſpoils by age, provided that while it is kept idle you give it a little air.

“ About four o'clock in the afternoon all the liquor was emptied into the copper, with the addition of a ſufficient quantity of urine to replace what had been evaporated and loſt in the preceding work. This generally requires about eight or nine buckets of urine. The copper was then heated, the ſcum taken off as before: when ready to boil, it was returned into the wooden vat. You add to it a pound of indigo, pounded and mixed with urine as above, a pound of alum, a pound of tartar, a pound of madder, and two quarts of urine. After the vat is ſtirred and cloſe covered, it is ſuffered to ſtand all night. It will be in a proper ſtate the next day, and capable of dyeing 60 pounds of wool at twice, as above. In this manner, the reheatings ſhould be always done the day before you want to dye, and may be repeated *ad infinitum*.

“ It is neceſſary to obſerve, that the more indigo you put into the vat at once, the deeper the colour: thus, inſtead of one pound, you may add four, five, or fix, without increaſing the quantity of alum, tartar, or madder; but if the vat contains more than three hogheads, the quantity of the ingredients ſhould be proportionably augmented. That which I have juſt mentioned contained only three hogheads, and was conſequently too ſmall to dye at one time a ſufficient quantity of wool to make a piece of cloth, *viz.* 55 or 60 pounds. To do this properly, it ſhould contain ſix hogheads, which would be attended with a double advantage. Firſt, all the wool might be dyed in two or three hours; whereas, by twice dipping, it could not be finiſhed in leſs than eight or ten. Secondly, at the expiration of the three hours, the vat would be ſtill very warm; ſo that, after ſtirring and letting it ſettle for a couple of hours, the ſame wool may be dipped again. By this means the colour is heightened almoſt as much more; becauſe wool once dyed always takes a much better colour than new or white wool, though ſuffered to remain in the vat even for 20 hours.

“ It is neceſſary to be very attentive in opening the dyed balls as ſoon as they are taken out of the vat, and expoſing them to the air, in order to change them from green to blue, which ſhould be done by many hands at the ſame time, that they may be equally affected by the air, elſe the blue colour will not be uniform.

“ Some manufacturers pretend that cloth, the wool of which had been dyed in this urine vat, cannot be preferable^{to Paſſel vats} perfectly ſcourd by fulling even at twice; others to the contrary, and I believe they are right. Nevertheless, if the firſt be right, one would ſuppoſe that the animal oil of the urine was become refinous by drying on the wool, or that incorporating with the oil by which the wool had been moiſtened for its other preparations, it would be more likely to reſiſt the fuller's earth and ſoap than ſimple oil by expreſſion. To remedy this, it is only neceſſary to waſh the wool^{bove.} in

in running water after it has been dyed, expressed, and opened, ungreened, and again cold. Be this as it may, a paillet vat in a large dye-house is preferable to those kinds of indigo vats prepared with urine; because with a good woad vat and a dexterous woad-man, you expedite more work than could be accomplished with any other blue vat. In mentioning the several indigo vats in this treatise, my design is not so much to introduce them to great manufactories, as to assist those who work at small fabrics; to whom, I flatter myself, this treatise will be equally useful. I will even describe a cold vat for the dyers of small stuffs mixed with thread or cotton, which succeeds very well, but which would be of no use for woollens.

33
Another
cold indigo
vat.

"In some places they make use of a cold indigo vat, differing from that already mentioned, which is more commodious, as it is much sooner ready, and has no bad smell. It is prepared in the following manner.

"Three pounds of indigo, well pulverized, is put into a glazed earthen vessel, and dissolved in three pints of soap-boiler's lixivium, which is a strong solution of fossil alkali with quicklime. I have made use of a solution of potashes, and succeeded very well. The solution of indigo is performed in about 24 hours, as may be easily discovered by its remaining suspended in the liquor, which is thereby thickened, and becomes like an extract. At the same time you put into another vessel three pounds of slacked lime sifted with six quarts of water. The whole should boil during a quarter of an hour, and when settled should be drained off clear. You afterwards dissolve in this lime-water three pounds of green copperas, suffering it to settle till the next day. You then put 75 gallons of water into a large deal cask, the only wood proper for the purpose; as any other, particularly oak, would blacken and tarnish the liquor. The two solutions, which had been prepared the night before, are then added, the vat stirred, and left to settle. I have seen it sometimes take the colour in two hours; but with this vat it was very different, not being ready till very late the next day. It produces a great quantity of froth; and the liquor takes a fine green colour, but a little yellowish, something like the green of the common vat.

"When the vat is almost exhausted, it is replenished and quickened without fresh indigo, by adding to it a small liquor, consisting of two pounds of green copperas dissolved in a sufficient quantity of lime-water. But when the colour of the indigo is quite exhausted, it should be replenished with fresh indigo dissolved in a lixivium, such as I have just described. It is natural to suppose, that the quantity of your other ingredients must be augmented or diminished in proportion to the indigo. Some dyers use a mixture of vinegar and water impregnated with rusty iron. They suppose that the colour is thereby rendered more solid; but I am convinced by experience that there is no necessity for it, and that the colour is as permanent as any of the other blues prepared as I have directed above.

"The first time I prepared this vat, I proceeded according to a receipt sent me from Rouen. The soap-boiler's lixivium was simply denominated *strong water*. I suspected this to proceed either from malice or mistake, nevertheless, as in matters of fact it is unjust

to condemn without examination, I tried the common aqua-fortis, which produced the following effect.

"I took half a pound of indigo, well powdered, and steeped it in half a pint of common aqua-fortis, made with vitriol and salt-petre: this produced a fermentation. In this situation I left it for 24 hours; and having, as in the preceding operation, dissolved a pound of copperas in some lime-water, I poured these two mixtures into a cask containing about 17 gallons of river water. I stirred it well, but there appeared nothing extraordinary the next day. I still continued to stir three times a-day for two days together, and then suffered it to rest for two days more, persuading myself that it was absolutely spoiled. At the expiration of these four days, the liquor became of a red colour, but clearer than the paillet vats. I stirred it once more, and let it stand six days longer: it had then a little froth, but very pale; six days afterwards the surface of the liquor became brown, and underneath a brown green. I stirred again, and fancied that the liquor underneath was still reddish, though the froth which it threw up was of a good colour; I therefore conceived hopes that it would do, and that I should be able to work it the next day.

"At the expiration of sixteen hours I dipped some cotton, which took colour, but so very weak, that I was obliged to let it remain in the liquor several hours, till the blue became sufficiently deep. It then withstood the summer air and sun tolerably well for 12 days; nevertheless, I had the vat thrown out as useless, on account of its tedious operation. Doubtless it might have been recovered with lime, or some other alkali that would have absorbed the acid of the aqua-fortis, but it was not worth the pains. Besides, the answer which I received from the person who sent me the receipt from Rouen, contained an explanation with regard to the kind of aqua-fortis that should be used; from which I learnt that it should have been the soap-boiler's lixivium, which, instead of being acid, is one of the most caustic alkalies. In fact, by making use of this alkaline lixivium, the operation was attended with immediate success, and never failed me since.

"I tried several of these different vats in miniature, in cucurbits, put into a water or sand bath. These in last are attended with no difficulty; it is only necessary to diminish the quantity of the liquor, and of every ingredient, in proportion to your vat, and it is scarce possible it should not succeed.

"Concerning that which I first described, and which is set hot, as it is attended with a little more difficulty, and several persons may wish to try this operation themselves, being rather curious, and requiring neither expense nor preparation in miniature; I will give the description of a process which succeeded extremely well, and which I purposely supplied with much more indigo than is generally done in the common method.

"I boiled two quarts of water with two drachms of madder, and four ounces of pearl-ashes. When it had boiled a quarter of an hour, I poured it into a cucurbit, containing about a gallon, which was previously heated with hot water, in which I had put a quarter of a handful of bran. The whole being well stirred with a deal spatula, I put my cucurbit into a very

moderate sand heat, sufficient only to keep it warm, or nearly of the same degree of heat requisite in a common indigo vat.

"I continued the sand heat all night and the next day, without perceiving any alteration. I stirred it only twice during the day with the spatula. The day following it produced an efflorescence, formed a coppery scum on the surface, and the liquor became a brown green. I then filled it with a mixture, composed of a quart of water, two ounces of pearl-ashes, and a little bran. It was well mixed, and then left to settle. It became perfectly well coloured, and the next day I dyed several bits of woollen stuffs. These vats are reheated and replenished with as much ease as a great one."

56
Method of
dyeing
wool or
woollen
stuffs in any
of these
vats.

"After having prepared the vats according to any of the methods above mentioned, the dyeing any kind of woollen stuff is exceedingly easy; no other preparation for the dye being requisite than simple immersion in warm water, wringing them, and then dipping them in the vat for a longer or shorter time according to the deepness of the colour you wish to impart. From time to time the stuff should be opened; that is, taken out and wrung over the vat, and exposing it for a minute or two to the air till it becomes blue; for it must be observed, that in all the solutions of indigo or other materials hitherto described, the blue colour is produced by exposure to the air alone, and the stuff is always taken out green, and will retain that colour if not exposed to the air. In dyeing blue, therefore, it is necessary to let the colour change in this manner before you immerse it a second time, that the shade may be the better distinguished; for dark blues require to be dipped several times, but it is dangerous to make this experiment with light blues. When a large quantity of wool is to be dyed, which cannot be put into the vat all at once, it very often happens that the quantity first put in will take up the deepest dye. To prevent this, some dilute their indigo-vat with a quantity of warm water; but M. Hellet disapproves of this, as being apt to produce a fading colour. The best method, he says, is to dip them when the vat is nearly exhausted; and for this purpose he recommends the pastel-vat rather than any other: and though the colours produced in this manner are less bright than the others, they may be sensibly enlivened by passing the stuffs through boiling water. This, he says, is proper for all blue colours; as it not only renders the dye more fixed and bright, but cleanses the stuffs from accidental impurities. After the work is taken out of the hot water, it is to be rinsed in a running stream. It will be still more proper to full a dark blue stuff well with soap and water, and afterwards to rinse it in running water; for the soap will be so far from injuring the colour, that it will thereby be rendered more bright and lively. Some dyers, in order to save the dearer ingredients of pastel or indigo, make use of logwood; but this is by no means allowable, as the colour, though rather brighter than that of indigo, is exceedingly perishable. In 1748, M. Macquer of the Royal Academy of Sciences discovered a method of dyeing silk and cloth with a preparation of Prussian blue, superior to all the blues hitherto discovered. This, however, has never yet come into practice, nor is it at all probable that the colour of this pigment

can ever be made to stand washing with soap. In all the methods in which we could try the experiment, it could not even bear washing with plain water. Indeed, when we consider the great volatility of the colouring matter of Prussian blue, that it can only be fixed by iron, and that any alkaline matter will instantly disengage it, and make it resume its former volatility, there can be but very little hope of overcoming the difficulties which attend the process.

Having been so particular with regard to the pre-M. Mac-
paration of the materials and method of dyeing wool, quer's me-
we need say the less concerning the method of dyeing thod of
silk or cotton. The following composition is recom- dyeing silk
mended by M. Macquer. "To eight pounds of the of a blue
finest indigo add six of the best pearl-ash, from three colour.
to four ounces of madder for every pound of althe, besides eight pounds of bran, washed in several waters to take out the flour. When washed, and most of the water squeezed out, it is placed alone at the bottom of the vat. The pearl ash and the madder are then mixed, bruising them thoroughly together, and then boiling them for a quarter of an hour in a copper containing two thirds of the vat; the liquor is then suffered to rest, and the door of the furnace shut.

"Two or three days previous to this, eight pounds of indigo are steeped in a bucket of warm water, washing it well, and even changing the water, which has a reddish cast. Some begin with boiling the indigo in a ley of one pound of pearl-ash with two buckets of water; after which they pound it while quite wet in a mortar; then while it is yet in a paste, they fill the mortar with hot liquor which has been boiled before; letting it stand to settle for a short time, and then pouring off the clear into a separate boiler or into the vat. The same quantity of the mixture is then poured on the indigo which remained in the mortar, bruising and mixing it well, and then as before pouring it off into the boiler; which operation is repeated till the whole of the indigo is thus dissolved in the liquor. That in the boiler is gradually poured into the vat upon the bran in the bottom, adding afterwards the remainder of the composition, grounds and all. After stirring and raking for some time, it is let stand, but without fire, till it becomes cool enough for the hand to bear. After this a little fire is to be put round the vat, only to preserve the same degree of heat; and this should be continued till the liquor becomes green, which is easily known by trying it with a little white silk. This shows that the vat is in a proper state; but in order to be ascertained of this, it will be necessary from time to time to stir it with a rake, when the brown and coppery scum which appears upon it after standing for a little time shows that it is in a proper state for working. Even in this case it is necessary to behave with the utmost caution, and to observe whether on blowing aside the coppery scum just mentioned a fresh one appears or not; for if it does not, it is a sign that the vat is not yet ready. If the scum appears, it must stand three or four hours, when a new composition is made to complete it. For this purpose as much water as is necessary to fill the vat is put into a copper, boiling it with two pounds of ashes and four ounces of madder as at first. This new liquor is poured into the vat, raked and mixed, and then left to stand for four hours, when it is ready for dyeing.

The method of preparing silk for the blue dye is by boiling with soap, using 35 or 40 pounds of the latter to 100 of the former; but no impregnation with alum is required. Before dipping it in the vat, however, it should be washed from the soap; and to cleanse it more effectually, it ought to be twice beetled at the river, having been divided into hanks for the convenience of wringing. After being dipped in the vat, it is to be wrung as hard as possible, and then opened out to the air, to give it the blue colour, as directed for wool; it should then be immediately washed in two waters, and well wrung out again. Lastly, it is to be dried as quickly as possible; cutting the thread which ties it, if the hanks are large, because if kept tied it frequently turns red under the thread.

Silk dyed as above directed is apt to take the blue very unequally, and will most certainly do so, if not washed and dried immediately after dyeing. Fine dry weather is always best for these operations; for should water accidentally fall upon it, it would be full of reddish spots. In moist weather, therefore, and during the winter, a room with a stove will be necessary. Different shades of blue are produced by dipping that silk which is intended for the darkest colour.

The method of dyeing cotton or linen blue is so little different from that already described with regard to woollen or silk, that nothing farther needs be said concerning it; only the colour upon cotton is generally less bright. M. de Auligny indeed tells us, that he has discovered a method of dyeing cotton velvets of a most beautiful and durable blue: but as he does not choose to communicate it, nothing can be said on the subject. In the former edition of this work, a receipt was given for dyeing cotton of a very good blue colour, and which, as being instantaneously done, may occasionally be useful. The indigo is dissolved in a mixture of lime and potash (probably the pure caustic lixivium would answer fully as well); and after it is dissolved, some raisins beat into a pulp in a brass or marble mortar are to be added. This very soon produces a copper-coloured scum at top; and the cotton being now dipped into the liquor receives the colour in an instant. Linen may be dyed in the same manner.

The next of the primitive colours to be considered is red; of which there are many varieties: but the principal are scarlet, crimson, and madder red. The dyeing of these colours differs considerably from that of the blues, because they require a previous preparation in the stuffs to be dyed; and it is on this preparation that the goodness of the colour very often depends. These preparations are generally alum, tartar, aquafortis, aqua-regis, or solution of tin in these acids. Galls and alkaline salts are also sometimes added, tho' they do not of themselves contribute any thing to the colour.

There are three kinds of scarlet, viz. that dyed with kermes, with cochineal, and with gum-lac. The first, called *Venetian scarlet*, is the least bright, but more permanent, and less apt to be spotted than the others; inasmuch that in some pieces of tapestry done with this at Bruxelles in Flanders, it has scarce lost any of its vivacity in 200 years. However, it is scarce ever used except for tapestry, and is dyed in the following manner, according to Mr Hellow.

“The wool should be first drenched; for which

purpose you put half a bushel of bran into a copper, with a quantity of water sufficient for 20 pounds of wool, which to the best of my knowledge is the usual batch for one dyeing. In this liquor it should boil for half an hour, stirring it from time to time; after which it is taken out and drained. I shall observe, once for all, that when you dye worsted, you put a rod through each skein, which commonly weighs about a pound, and which should be kept on the rod during the whole process, by which means the skein is prevented from tangling. It is also convenient for turning the skein, in order to dip each part, that the whole may be equally coloured; for which purpose, you raise it about half way out of the liquor; and holding the rod with one hand, you pull the skein with the other, so as to let the part which before was next the rod fall into the liquor. If the worsted should be too hot for the fingers, it may be done by means of another rod. The equality of the colour depends so entirely upon the frequency of this manœuvre, that it cannot be too strenuously urged. In order to drain them, you rest the ends of the rods just mentioned on two poles; which should be fixed in the wall over the copper.

“While the worsted is draining, after being thus drenched, you prepare a fresh liquor, viz. by throwing out what remained in the copper, and replenishing with fresh water; to this you add about a fifth part four water, four pounds of Roman alum grossly pounded, and two pounds of red tartar. As soon as it boils, the worsted on the rods should be immersed for two hours, almost continually moving the rods, one after another, as I have before directed.

“It is necessary to observe, that after the alum is put in, when the liquor is ready to boil, it will sometimes rise suddenly out of the copper, if you do not mind to check the boiling by throwing in cold water. If, when it is ready to boil, you put in the cold worsted quickly, it will have the same effect. It is also proper to observe, that when dyers work in the great, they should have their legs bare, that the hot liquor may not rest in the stockings. When the quantity of tartar is rather considerable, as in the present operation, the liquor does not rise so high; but when there is nothing besides the alum, sometimes, when it begins to boil, half of the liquor boils over, unless prevented by the above precautions.

“When the worsted has boiled in this liquor for two hours, drained, lightly squeezed, and put into a linen bag, it is deposited in a cool place for five or six days, and sometimes longer; this is called *leaving the worsted in the preparation*. This delay helps it to penetrate, and increases the action of the salts; for as a part of the liquor constantly evaporates, it is clear that what remains, being more impregnated with the saline particles, becomes more active, that is to say, provided there remains a sufficient degree of moisture; for the salts being once crystallized and dry, their power is destroyed.

“When the worsteds have remained in this state for five or six days, they are then in a proper condition for being dyed. A fresh liquor is then prepared, according to the quantity of the worsted; and when it grows warm, if you want a full scarlet, you throw into it 12 ounces of pounded kermes to every pound of worsted; but if the kermes be stale, it will require pound for pound.

38
Of dyeing
cotton or
linen blue.

39
Of dyeing
red colours.

40
Venetian
Scarlet.

pound. When the liquor begins to boil, the worsted should be put in, being still moist; but if it has been suffered to grow dry after boiling, it should be put in to warm water, and well drained.

"Before you put the wool into the copper with the kermes, it were advisable to throw in a small handful of refuse wool, which, being boiled for a moment, imbibes a part of the blackness and dross of the kermes; so that the wool afterwards dyed takes a much more beautiful colour. You now dip the skeins on the rods in the same manner as in the preparation, continually stirring them, and giving them air, from time to time, one after another. In this manner they should be kept boiling for a full hour. They are then washed and drained.

"If you would reap any advantage from the dye still remaining in the liquor, you may dip a little prepared wool, which will take a colour in proportion to the goodness of the kermes, and to the quantity which had been put into the copper.

"If you mean to dye a number of shades, one darker than another, you require much less of the kermes; 7 or 8 pounds being sufficient for 20 pounds of prepared wool. You then dip the quantity of worsted intended for the lightest shade, leaving it in the copper no longer than necessary, in order to turn it, that it may imbibe the colour equally. It is then raised upon the pegs, and the next shade immediately put in, and suffered to remain for a longer time. You proceed in this manner to the last shade, which should also remain till it has acquired the colour you desire.

"You begin with the lightest colour, because if the wool was suffered to remain in the copper longer than necessary, it would be no loss, provided you reserve this batch for the darker shade: whereas, by beginning with the darkest, you would have no remedy in case of any accidental slip in the light shades. The same precaution is necessary in regular shades of all colours; but of the colour in question these are seldom made, because the dark shades are not much in use: and as the operation for all colours is the same, what I have said respecting this will answer for all the rest.

"When the wool has been dyed in this manner, and before it is carried to the river, you may swell it in warm water, with a small quantity of soap, well dissolved; this adds a brightness to the colour; but, at the same time, gives it a little of the rose, that is to say, a crimson tinct.

"In order to render this colour more bright and beautiful than common, I have tried a great number of experiments, but could not obtain a red equal to that produced by cochineal. Of all the liquors for the preparation of wool, that which succeeded the best was made according to the proportions I have mentioned. By changing the natural tinge of the kermes, by various kinds of ingredients, metallic solutions, &c. various colours may be obtained, which I shall presently mention.

"It is impossible to prescribe any proportions for an ell of stuff, considering the infinite variety of their breadth, and even of their thickness, and the quantity of wool in their fabrication; experience is the best guide. Nevertheless, if you chuse to be exact, the surest way is to weigh the stuff to be dyed, and to di-

minish about one quarter of the colouring ingredients prescribed for worsteds; because the stuffs take internally less colour, as their texture, being closer, prevents it from penetrating; whereas the worsted or woollen fleece takes the colour internally as easily as on the exterior surface.

"The alum and tartar, used in the preparation for stuffs, should also be diminished in the same proportion; neither is it necessary to let the stuffs remain in the preparation as long as the worsted: they may be dyed even the day after they had been boiled.

"Woollen fleece dyed in the red of kermes, and to be afterwards incorporated in mixed cloth, or for the manufactory of thick cloths, will have a much finer effect than if dyed with madder.

"A mixture of half kermes and half madder, is called ⁴¹Half grain ed scarlet in half-grain. This mixture gives a colour scarlet extremely permanent; but not so lively, inclining rather to a blood colour. It is prepared and worked precisely in the same manner as if kermes alone were used; only that in the liquor they put but half this grain, the other half is supplied by madder. This is consequently much cheaper; and it frequently happens that the dyers who make it, render it much less beautiful than it might be, by diminishing the quantity of the kermes and increasing that of the madder.

"From the trials made on scarlet in grain, or scarlet of kermes, both by exposing it to the sun and by various liquors, it is proved that there does not exist a better nor a more lasting colour. It may for solidity be compared to the blues already mentioned. Nevertheless, the kermes is scarce ever used except at Venice; for since the fiery scarlets are become the taste, this colour is almost entirely exploded. It has, notwithstanding, many advantages over the other, as it neither blackens nor spots; so that should the stuff yet greased, the spot may be taken out without impairing the colour. Nevertheless, kermes is so little known to the dyers, that when I wanted a certain quantity for the above experiments, I was obliged to have it from Languedoc; the merchants of Paris encumber themselves with no more than what they vend for the use of medicine."

"The second kind of scarlet, viz. that dyed with cochineal, is much more expensive and less permanent than ⁴²scarlet. For inferior uses, such as tapetries, the colour is sometimes partly done with Brazil wood; but this colour cannot be made equally permanent with cochineal: and it is remarkable, that in whatever manner these fugitive colours be mixed with permanent ones, the latter never convey to them any portion of their durability, but, on the contrary, both go off together. The true cochineal scarlet is very difficult to dye in perfection, and almost every dyer has a receipt of his own for the purpose. The success of the whole operation, however, according to Mr Hellot, depends upon the choice of the cochineal, the water used for dyeing, and the method of preparing the solution of tin, which is now universally known to be the only ingredient by which a scarlet colour can certainly be produced. The following is his receipt for the preparation of this liquid, which from his own experience he gives as the best. To eight ounces of spirit of nitre add as much river water, dissolve in the mixture gradually half an ounce of very white sal-ammoniac,

in order to make an aqua regis, to which add two drachms of purified salt-petre. This last ingredient, he owns, might be omitted; but he is persuaded that the use of it contributes to make the colour more uniform. In the liquor thus prepared dissolve an ounce of English tin reduced into grains by dropping it, when melted, into a basin of cold water. These are to be dropped into the liquor one by one, waiting for the dissolution of the first before we add a second, in order to preserve a quantity of red vapours, which are the phlogisticated nitrous acid; and to the mixture of which he supposes the beauty of the colour is partly owing. The solution prepared in this manner is of the colour of solution of gold; and if fine tin be made use of, there is neither black dust nor sediment of any kind to be seen in it; but though transparent when just made, it is apt to become milky with the heats of summer; which, however, is no detriment to it in our author's opinion: and it is certainly just, if the transparency returns with the coolness of the solution. The aquafortis or spirit of nitre used for this purpose ought to be such as will dissolve half its weight of silver: and by following this method you will always be certain of having a composition of an equal strength; so that any slight difference which may arise from the quality of the cochineal will scarce be perceived. A weak solution makes the scarlet incline towards crimson, and a strong one towards orange.

43
Preparation
of
worsted
for the
scarlet dye.

When worsted is to be prepared for the scarlet dye, the following operation is necessary. For every pound of the stuff, ten gallons of clear river water are to be put into a small copper; and when it becomes pretty hot, two ounces of cream of tartar, and a drachm and an half of cochineal, both finely sifted, are to be added. A brisk fire is to be kept up; and when the liquor is ready to boil, two ounces of the composition already described must be added, by which the liquor is immediately changed from crimson to blood colour. As soon as it begins to boil, the worsted, previously steeped in hot water, and then expressed, is to be added. It must be suffered to boil for an hour and an half; after which it is taken out, gently squeezed, and washed in cold water, having taken care to stir it constantly all the time. It will now be a tolerable flesh colour, or even somewhat darker, according to the goodness of the cochineal and the strength of the solution of tin; but the colour will be so totally absorbed by the stuff, that the remaining liquid will be almost as colourless as water. This is called the *scarlet boiling*; and without this the dye would not hold. To finish the dye there must be another preparation of very clear water, the goodness of this being of the utmost consequence to the goodness of the colour. In this preparation, along with the other ingredients, there must be half an ounce of starch; and when the liquor is pretty hot, six drachms and an half of cochineal, likewise finely powdered, is to be added. A little before it boils, two ounces of the solution of tin are put in; by which, as in the former case, the colour is instantaneously changed. As soon as it begins to bubble, the worsted is to be dipped, allowed to boil an hour and an half, stirring it all the time, and then washing it as already directed. An ounce of cochineal will be sufficient to give a proper

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depth of colour to a pound of wool; a drachm or two more might be added, if you would have the colour very deep, but if it be much enlarged, the dye will turn out very dull.

In dyeing the scarlet colour, the material of which the cauldron is made is by no means a matter of small consequence. On this our author has the following observations. "Their cauldrons in Languedoc are made of fine tin. They are also used by several dyers at Paris; but Mr Julienne, whose scarlet is very highly esteemed, makes use of brass cauldrons. These are also used in the dyeing manufactory of St Dennis. Mr Julienne is careful only to suspend a large pack-thread net, with pretty small meshes, in his cauldron, to prevent the stuff from touching. At St Dennis, instead of a net, they use a large open wicker basket; but this is less convenient than the net, because it requires a man at each side of the copper to keep it even, and to prevent it, when loaded with the stuff, from rising to the surface of the liquor."

"This practice, so different with regard to the materials of the cauldron, determined me to make an experiment. I took two ells of white Sedan cloth, which I dyed in two cauldrons, one of copper, furnished with a pack-thread net, and another of tin. I weighed the cochineal, the composition, and other ingredients, with as much accuracy as possible. They boiled exactly the same time. In short, I was sufficiently attentive to make the operation the same in every particular; that in case of any perceptible difference it could only be attributed to the different materials of the cauldrons. At the first boiling, the two patterns were absolutely alike, except that the piece done in the tin cauldron was rather more marbled, and not quite so even as the other; but this in all probability might be occasioned by their not having been equally cleansed at the mill. I finished each piece in its proper cauldron, and they were both of them very beautiful. Nevertheless, it was very evident that the cloth which had been dyed in the tin was more fiery, and the other rather more crimsoned. They might have been easily brought to the same shade; but this was not my object. From this experiment, it appears that, with a copper cauldron, the quantity of the composition should be increased; but then the cloth grows harsh to the feel. Those who dye in copper, to prevent this evil add a little of the turmeric, which is a drug only used for false colours, and therefore prohibited by the regulations to dyers in grain, but which gives scarlet that dazzling fiery colour so much the fashion at present. It is, however, if you have any suspicion, easy to discover the deception, by cutting the pattern with a pair of scissors. If it has no turmeric, the cut edge will appear white, otherwise it will be yellow. When the close texture is equally dyed with the superficies, let the colour be what it will, they say the colour *cuts*, and the contrary when the middle of the texture remains white. Legitimate scarlet never cuts. I call it *legitimate*, and the other *false*, because that with the addition of the turmeric is more liable to fade. But as the taste for colours is so variable, as the bright scarlets are at present the mode, and as it is necessary, in order to please the buyer, that it should have a yellow cast, it were better to authorise the use of the turmeric, though

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a false colour, than to allow too large a quantity of the composition, by which the cloth is injured, being more liable not only to dirt, but also to tear, as the fibres of the wool are rendered brittle by the acid.

"I must also add, that a copper cauldron should be kept extremely clean. I have myself frequently failed in scarlet patterns by neglecting to clean the cauldron. I cannot in this place forbear condemning the practice even of some eminent dyers, who at about six o'clock in the evening make their preparation in a copper cauldron; and, in order to gain time, keep it hot till day-light the next morning, when they dip their stuffs. The preparation must undoubtedly corrode the copper during the night; and consequently, by introducing coppery particles into the cloth, injure the scarlet. They will tell us that they do not put in the composition till immediately before the cloth is dipped: but this is no apology; for the cream of tartar added on the preceding evening being sufficiently acid to corrode the copper, forms a verdigris which dissolves, it is true, as soon as it is formed, but which nevertheless produces the same effect.

46
How to
preserve a
tin caul-
dron from
melting.

"As tin is absolutely necessary in the scarlet dye, it were much better to have a cauldron of this metal, which would infallibly contribute to the beauty of the colour. But the price of these cauldrons, if sufficiently large, is an object of consideration, especially as they may melt in the first operation if not carefully attended to by the workmen. Besides, it would be very difficult to cast a vessel of so large a size without flaws that would require to be filled. It is absolutely necessary that they be made of block tin. If the flaws should be filled with solder, which contains a mixture of lead, many parts of the cauldron will retain the lead, which being corroded by the acid composition will tarnish the scarlet. Hence there are inconveniences in every particular: nevertheless, if it were possible to procure a skilful workman capable of casting a cauldron of the Melac tin without flaw, it were certainly preferable to every other; for though the acid of the composition should in some parts corrode it, the detached particles will do no harm, as I have already observed.

"There is no danger of melting a tin cauldron, but when it is emptied in order to fill it with a fresh liquor. I shall therefore add the precautions necessary to prevent this evil. In the first place, the fire should be taken entirely from the furnace, and the remaining embers quenched with water. Part of the liquor should then be taken out with a bucket, while the remainder should be dashed about with a shovel by another person, in order to keep the upper part of the cauldron continually moist, at the same time cooling what remains in the cauldron with cold water. In this manner it should be continued till you can touch the bottom without being burnt. It should then be entirely emptied, and all the sediment taken up with a moist sponge. This attention will preserve your cauldron.

47
Why wool
in fleece is
never dyed
scarlet.

"Woollens are never dyed scarlet in the fleece, for the two following reasons: The first is, or ought, to regard all stuffs of simple one colour; those of many colours are called *mixed stuffs*. These kind of stuffs are never dyed in the wool, especially when the colours are bright and fine; because, in the course of the fabrica-

tion, the spinning, twisting, or weaving, it would be almost impossible to prevent some white or other coloured wool from mixing, which though ever so trifling would injure the stuff. For which reason, reds, blues, yellows, greens, or any of those unmixed colours, should not be dyed till after they have been manufactured. The second reason is peculiar to scarlet, or rather to the cochineal, which being heightened by an acid, cannot stand the fulling without losing much of its colour, or being at least excessively crimsoned. For the soap which contains an alkaline salt destroys the vivacity produced by the acids. Hence it is evident that neither cloth nor stuffs should be dyed scarlet till they have been fulled and dressed.

"To dye different pieces of cloth at the same time, the directions already given do not entirely answer.

"For example, in order to dye five pieces of Car-⁴⁸
cassionne cloth at the same time, each piece five quar-^{Directions}
ters broad, and fifteen or sixteen ells in length, it is^{for dyeing}
necessary to observe the following proportions: You^{different,}
begin by making the composition in a very different^{pieces of}
manner from the preceding process, viz. twelve pounds^{cloth at the}
of aquafortis put into a stone jar or glazed vessel, with^{same time.}
twenty-four pounds of water, and one pound and an
half of tin grains added. The solution goes on more
or less slow according to the acidity of the aquafortis,
and should stand for twelve hours at least. During
this time a kind of blackish dirt falls to the bottom;
the top should be then drained off the sediment: this
liquor is of a clear lemon colour, and is preserved by
itself. This process evidently differs from the first by
the quantity of water mixed with the aquafortis, and
by the small portion of tin, of which scarce any re-
mains in the liquor; for the aquafortis not being in
itself a solvent for tin, only corrodes and reduces it to
a calx, provided neither saltpetre nor sal ammoniac be
added, which would convert it into an aqua regia.
The effect of this composition is not, however, differ-
ent from others, and is perceptible to those who
from experience are competent judges of this colour.
The composition without sal ammoniac has been for a
long time used by the manufacturers of Carcassonne,
who doubtless imagined that its effect was owing to a
supposed sulphur of tin, and may be preserved from
putrefaction for thirty hours in winter and only twen-
ty-four in summer. It then grows turbid, forms a
cloud, which falls to the bottom of the vessel in a
white sediment. This sediment is a small portion of
the tin, which was suspended in an acid not prepared
for the solution. The composition, which ought to
be yellow, becomes clear as water; and if employed in
this state never succeeds, but produces the same effect
as if it had been milky.

"When the composition is prepared, as I have now
described, according to M. de Fondieres, you put, for
the quantity of cloth last mentioned, about sixty cubic
feet of water into a large copper; when the water
grows warm, you add a sackful of bran: it is some-
times necessary to use four water; they will either of
them do, as they say, to correct the water, viz. to ab-
sorb the terreous and alkaline substances, which crimson
the tinge of the cochineal. We should be well
informed concerning the nature of the water employed,
in order to know whether these correctives be neces-
sary.

"Be it as it may, when the water is a little more than warm, you add ten pounds of crystals or cream of tartar pulverised, that is to say, two pounds to each piece of cloth. The liquor should be then violently stirred; and, when rather hot, you should put into it half a pound of the powder of cochineal, mixing it well together, and immediately afterwards you pour into it twenty-seven pounds of the composition, very clear, which also requires to be well stirred. As soon as it begins to boil, the cloth being immerfed, should boil very fast for two hours, and during that time should be kept in continued motion on the wynch, and when taken out passing it through the hands by the lifting, in order to open and give it air. It is afterwards carried to the river and well washed.

49
Method of
stirring the
cloth.

"In order perfectly to understand the method of stirring the cloth, it is requisite to observe, that a kind of reel or wynch, with a handle for turning, should be placed horizontally on the iron hooks which are fixed in the felles that support the edge of the cauldron. You first join the several ends of each piece of stuff to be dyed at the same time; and as soon as they are immerfed, you carefully keep the end of the first piece in your hand; you then lay it on the reel, which should be turned till the end of the last piece appears. It is then turned the contrary way, and in this manner every piece will be dyed as even as possible.

"When the cloth has been well washed, the cauldron should be emptied, fresh liquor prepared, to which you must add, if necessary, a sack of bran or some four water; but if the quality of the water be very good, there is no occasion for any addition. When the liquor is ready to boil, you put in eight pounds and a quarter of cochineal pulverised and sifted. The whole is then mixed together as even as possible; but when you cease to stir, you must mind when the cochineal rises to the surface, forming a kind of foam of the colour of lees of wine. As soon as this foam begins to divide, you pour in eighteen or twenty pounds of the composition. You should have a vessel full of cold water near the cauldron ready to throw in, lest after putting in the composition it should rise above the edge, as is sometimes the case.

"When the composition is put into the copper, and the whole well mixed, you turn the wynch quick for two or three turns, that every piece may imbibe the cochineal equally. It is then turned more slowly, in order to let the water boil. It should boil very fast for two hours, constantly turning and keeping the cloth down with a stick. The cloth is then taken out, and passed through the hands by the lifting, in order to give it air and to cool it; it is afterwards washed at the river, dried, and dressed.

"There is a considerable advantage in having a great quantity of stuff to dye at the same time; as for example, when the five first pieces are finished there remains a certain quantity of the cochineal, which, supposing seven pounds at first, might amount to twelve ounces; so that cloth put into this second liquor will imbibe the same shade of rose-colour as if you had coloured a fresh liquor with twelve ounces of cochineal. The quantity remaining may, however, vary very much according to the quality of the cochineal, or according to the fineness of the powder. Though the quantity of colour remaining in the liquor may be very in-

considerable, it nevertheless deserves attention on account of the dearth of this drug. Of this liquor, therefore, a preparation may be made for five pieces of cloth; and it will require less of the cochineal and less of the composition, in proportion, as near as you can guess, to the quantity remaining in the liquor. This is also a saving of fuel and time; but it is impossible to give positive directions concerning this manœuvre, which must be left to the ingenuity of the dyer; for having dyed rose-colour after the scarlet, you may make a third preparation, which will dye a flesh-colour. If there is not time to make these two or three preparations in 24 hours, the liquor spoils: some dyers put Roman alum into the liquor to prevent it from spoiling; but this changes it to a crimson.

50
Scarlets
crimsoned
by alum.

"Scarlets thus crimsoned in the same liquor in which they had been dyed, are never so bright as those done in a fresh liquor. Drugs which reciprocally destroy each other's effect are more efficacious when employed in succession.

"When you dye cloth of different qualities, or any kind of stuffs, the best method is to weigh them, and for every hundred pound to allow about six pounds of crystals or cream of tartar, eighteen pounds of the composition in the preparation, the same quantity in the completion, and in each of them six pounds and a quarter of cochineal. For the accommodation of those who would make small experiments, the whole may be reduced, viz. one ounce of cream of tartar, six ounces of the composition, and an ounce of cochineal for every pound of stuff. Some of the Paris dyers succeed very well by putting two-thirds of the composition and a quarter of the cochineal in the preparation, and the remaining third of the composition, and the other three-quarters of the cochineal, to the completion.

"It is not the custom to put crystal of tartars in the finish: I am however convinced by experience that it does no harm, provided that at most you put but half the weight of the cochineal; and in my opinion it made the colour rather more permanent. There have been dyers who have dyed scarlet at three times: in this case they had two preparations, and afterwards the finish; but they always used the same quantity of drugs."

We have already observed, that the kermes were so little used for brown or Venetian scarlets, that these kind of colours were made with cochineal. For this purpose the preparation is made as usual; and for the dyeing they add to the liquor eight pounds of alum to every hundred weight of stuff. This alum is dissolved in a separate cauldron with a sufficient quantity of water: it is thrown into the liquor before the cochineal. The remainder is done precisely the same as in common scarlet: it gives the cloth the colour of Venetian scarlet; but it is not by any means so permanent as the colour obtained from kermes.

There are no alkaline salts that do not crimson scarlet; but it is more generally the custom to use alum, because these alkaline salts are no addition to the permanency of the colour, and may possibly injure the stuffs, because all animal substances are dissolved by fixed alkalis. The alum, by being deprived of its phlegm by calcination, will more certainly crimson. The liquor which had been used for crimsoning is red,

and still redder in proportion as the scarlet is more crimsoned, so that the colours part with much of their basis in the liquor by which they are darkened. It is, however, impossible to darken in grain without salts. The late Mr Barron, in a memoir which he presented to the Royal Academy of Sciences 12 or 15 years ago, remarks, that he succeeded better with the salt of urine, than with any other salt, for uniting the colour and preserving its brightness and fulness; but, as he observed, it is very inconvenient to make any quantity of this salt.

51
Quality of
the water
used in
scarlet of
great im-
portance.

It has been observed, that the choice of the water for dyeing scarlet was of importance; the greatest part of the common waters fadden, because they almost always contain a quantity of stony or calcareous earth, and sometimes of sulphureous or vitriolic acid. These are commonly called hard waters; by this term they mean water that will not dissolve soap, and in which it is not easy to dress vegetables. By absorbing or precipitating these heterogeneous substances, all waters are rendered equally good. If the matter be alkaline, a little four water will produce this effect. Five or six cubic feet of this four water, added to 60 or 70 cubic feet of other water before it has boiled, will cause the alkaline earth to rise in a foam which may be easily taken off the liquor. A sackful of any kind of white mucilaginous root cut in small bits, or, if dry, powdered, will also, if the sack be left to soak in the water for a half or three-quarters of an hour, correct a doubtful water; bran, as we have said above, will also answer the same end tolerably well.

52
Of gum-lac
scarlet.

The scarlet produced by gum-lac, though less bright than cochineal, has the advantage of being more permanent. The lac most esteemed for dyeing is of a branched form. The colour is that of an animal, like that of cochineal and kermes, and the branched kind has most of the animal particles in it. The best kind is of a blackish brown colour on the outside, and red within; and from some experiments made by M. Geoffroy, it appears to be a kind of comb, somewhat resembling that made by bees or other insects of that kind. Dyers sometimes use it when pulverised, and tied up in a bag; but to this M. Hellot objects, because some of the gum-resin being melted by the heat of the boiling liquid, escapes through the cloth, and adheres to it so closely, that it must be scraped off with a knife when cold. Others endeavour to extract the colour by boiling it in water after it has been reduced to powder, and then letting it stand to settle, and pouring off the coloured liquid; but in this way it often turns putrid. M. Hellot, therefore, after several unsuccessful trials to extract all the colour readily, had recourse at last to mucilaginous roots; which, without communicating any colour of their own, retained that of the lac so effectually as to remain with it upon the filtre. Comfrey-

53
M. Hellot's
method of
extracting
the colour
of gum-lac.

root was that with which he succeeded best. For extracting the colour, he used it dried and powdered, in the proportion of half a drachm to a quart of water. In this it is to be boiled for a quarter of an hour; then strained through a linen cloth, and poured while quite hot upon the gum-lac powdered and sifted through an hair-sieve. By this it immediately acquires a fine crimson colour; after which the whole is set to digest in a moderate heat for twelve hours, stirring the gum which remains at the bottom seven or eight times. The

water thus impregnated with the colour is afterwards decanted into a vessel large enough to contain four times the quantity, which is then to be filled with cold water. A small quantity of strong solution of Roman alum is then added; the coloured mucilage subsides; and if any colour remains in the liquor, it may be precipitated by the addition of some more alum, until at last the water will be left entirely colourless. After the crimson mucilage is entirely sunk to the bottom, the clear water is drawn off with a syphon, and the remainder put upon a filtre, to let the liquid slowly drop off or evaporate. If the whole of the colour be not extracted from the lac by one operation, it is to be repeated till no more appears, and the residuum becomes of a pale straw-colour. The best lac, detached from its branches, does not yield more than one-fifth of its weight in colour; and hence there is no great advantage to be made by substituting it in place of cochineal for the scarlet dye.

For dyeing scarlet with this extract of gum-lac, the requisite quantity of it, dried and powdered, is to be put into an earthen or block-tin vessel. Some hot water is then to be poured upon it; and, when well moistened, add the proper quantity of the scarlet composition, stirring the mixture with a glass pestle. By this means the powder, which before was of a dark dirty purple, acquires an exceedingly bright scarlet. The solution in which the crystals of tartar had been previously dissolved is then to be poured into the liquor; and as soon as the latter begins to boil, the cloth is to be dipped into it, turning it over and over according to the common method. The remainder of the operation is to be performed in the same manner as if cochineal were used. The extract, in our author's opinion, afforded about a ninth part more colour than cochineal.

Crimson is the colour produced by cochineal with alum and tartar only, without any solution of tin. For this colour two ounces and an half of alum, with an ounce and an half of white tartar, are to be taken for every pound of wool. These being put into a cauldron with a proper quantity of water, are to be made to boil before the stuff is put in. As soon as the liquor begins to boil, the wool is to be put into the cauldron, and the boiling continued for two hours; after which it is to be taken out, gently squeezed, rinsed in water, and put into a bag, which is also necessary to be done with the preparations for every other colour. A fresh liquor must be prepared for the dye, in which an ounce of cochineal is to be put for every pound of wool. When it begins to boil, the wool is to be put in, and managed as already directed for scarlet. For the finest crimson, the stuff, after the common process is finished, should be dipped in a new liquor in which a small quantity of sal ammoniac is to be dissolved, and an equal quantity of potash added after it is pretty hot.

A very beautiful crimson is obtained by boiling the wool as for common scarlet, then making a second preparation with two ounces of alum, and an ounce of tartar to every pound of wool. It should remain an hour in this decoction. A fresh liquor is then to be prepared immediately; in which to every pound of wool you put six drachms of cochineal. When it has remained an hour in this liquor, it is taken out and immediately dipped in a solution of barilla and sal ammoniac.

moniac; and in this manner a great number of very beautiful shades of crimfon may be prepared by diminishing the quantity of cochineal. In this process it is necessary that the mixture of alkaline falt and fal ammoniac should not be too hot, as this would caufe the volatile fpirit evaporate too quickly, and the cryftals of tartar alfo, being neutralifed, would lofe their effect.

For dyeing filk of a fine crimfon with cochineal, M. Macquer recommends only 20 pounds of foap to 100 of filk; "becaufe (fays he) the little natural yellow fill remaining in the filk, after only this quantity of foap, is favourable to the colour.

"Having wafhed and beetled the filk at the river to difcharge it well of the foap, it is put into a very ftrong folution of alhm, where it fhould remain generally from night till the next morning, about feven or eight hours. The filk is then wafhed and twice beetled at the river; during which time the following liquor is thus prepared:

"You fill a long boiler about one-half or two-thirds full of river water; when this water boils, you throw in fome white nutgalls pounded, letting it boil a little longer, about a quarter of an ounce to two ounces for every pound of filk. If the nutgalls are well pounded and fifted, they may be put in at the fame time with the cochineal.

"The filk being wafhed, beetled, and diftributed upon the rods, you throw into the liquor the cochineal, carefully pounded and fifted; it muft be then well ftirred with a flick, and afterwards boiled. You may put from two to three ounces for every pound of filk, according to the fhade required. For the moft common crimfon colours two ounces and an half is fufficient, it being feldom neceffary to ufe three ounces except for fome particular match.

"When the cochineal has boiled, you add to the liquor for every pound of cochineal about an ounce of the folution of tin in aqua regia; it is called *compofition*, and made in the following manner:

"One pound of the fpirit of nitre, two ounces of fal ammoniac, and fix ounces of fine tin in grains: the two laft are put into an earthen pot of a proper fize; twelve ounces of water is then poured on it, the fpirit of nitre afterwards added, and the whole left to difolve.

"This *compofition* contains much more tin and fal ammoniac than is ufed for the fcarlet of cochineal on wool; it is however abfolutely neceffary.

"This quantity of the *compofition* fhould be well mixed and ftirred in the liquor, and the copper then filled with cold water, about eight or ten quarts to every pound of fine filk; coarfe filk requiring lefs, as it occupies lefs fpace. The liquor is then fit to receive the filk which is immerfed, and returned till it appears uniform, generally requiring about five or fix returns. The fire is then ftirred; and whilst the liquor is boiling, which it fhould do for two hours, the filk is returned from time to time. The fire is then taken from under the copper, and the filk put to foak in the fame manner as for aluming. It fhould remain for five or fix hours, or even, if the liquor be ready at night, till the next morning. It is then taken out, wafhed at the river, twice beetled, wrung as ufual, and put on the perches to dry.

"To fadden the grain of fcarlets, the filk when taken out of the cochineal liquor is wafhed and twice beetled at the river; the water-liquor is then prepared, in fummer as it is, but in winter a little warmed, adding a folution of coppers, more or lefs according to the darknefs of the fhade required. The filk fhould be returned in this liquor, in fmall hanks, till it becomes very even; and when the fhade is equal to expectation, fhould be taken out, wrung and put to dry without wafhing if you like, becaufe the coppers liquor is little more than clean water. The coppers gives the cochineal a violet tinct, depriving it of its yellow. If, however, it fhould appear to lofe too much of its yellow, it may be preferved by adding to the coppers liquor a little of the decoction of fulvic. Nothing but coppers will fadden grain fcarlets; the logwood being quite ufelefs for this purpofe, coppers alone will fuffice, as it darkens greatly with the nutgalls ufed in grain fcarlets.

"The process juft related for producing this colour is the moft in ufe at prefent, as it gives a more beautiful fhade than can be obtained by any other method. Nevertheless, as many dyers proceed in the old way, we fhall defcribe it here.

"For thefe grain fcarlets the round pafte, as imported from the Indies, is added in the boiling of the filk. When the foap boils, about an ounce of rocou is bruifed in the cullender, in the fame manner as defcribed for orange-colours. It fhould be pounded as fine as poffible, leif any lumps fhould remain and flick to the filk.

"This fmall quantity of rocou, in the boiling of the filk, has the fame effect as the compofition, yellowing a little. The remainder of this process is juft the fame as the preceding; but without the addition of either compofition or tartar.

"The filk dyers are accuftomed to ufe only the fineft cochineal, and even always prefer the prepared cochineal, which is cleaned from all its impurities, fifted and picked. This is certainly commendable, confidering that the cochineal not prepared being lefs pure, the more of it muft be added, and that the dregs remaining in the liquor may injure the colour. The white tartar ufed in grain fcarlets ferves to exalt and yellow the colour of the cochineal, producing this effect by its acidity, all acids having the fame effect: we muft, however, obferve, that tartar is preferable, as it gives a more beautiful tinct. But, notwithstanding the quality of the tartar, it is ftill incapable of exalting the colour of the cochineal fufficiently to produce a grain fcarlet, whatever quantity may be added if employed by itfelf; for if the dofe of this ingredient be moderate, it will not yellow enough; and if too large, it deftroys and degrades the colour, without any good effect. In order to affift the tartar, it will be neceffary to add fome of the compofition, which, as we have feen, is nothing more than a folution of tin in aqua regia. This folution with cochineal, when ufed for dyeing of worfted, has a confiderable effect, changing it from a crimfon, its natural colour, to a prodigious bright fire colour; and produces only a crimfon when applied to filk: but it gives this colour a very beautiful tinct; for uniting with the tartar, it augments the effect without impoverifhing the colour, faving the rocou ground, as we have before obferved.

⁵⁷ Use of nutgalls in dyeing silk of a crimson colour. "As to nutgalls, they produce no good effect with regard to colour: on the contrary, if you use too much, they tarnish to a degree, entirely spoiling the colour; nevertheless, it is always the custom to put the quantity we have specified.

"One might probably conjecture from the introduction of this practice, that scarlets were formerly produced with cochineal, without either tartar or composition, yellowing only with rocou: silk dyed in this manner, however, would have no rustling, so that it could not be distinguished from silk dyed with Brazil wood. Nutgalls, on account of their concealed acid, having the property of giving the silk a great rustling, are therefore added with cochineal; by which means these scarlets are distinguished by the feel from the scarlet of Brazil wood: for we must observe, that the Brazil dye cannot stand the action of the nutgalls, by which it is entirely destroyed.

"But besides giving this rustling to the silk, it has at the same time the singular and very remarkable quality of adding to its weight very considerably; so that by putting one ounce of nutgalls to every pound of silk, you add two or two and a half *per cent.* to the weight: by this means some silk-dyers add even seven or eight *per cent.* They are so much accustomed to this advantage in weight, owing to the nutgalls, that even when this drug becomes useless by the addition of the tartar and composition, which produces the same rustling, they make it still necessary on account of the weight, which is not proportionably increased by the other acids. White nutgalls are always preferable to the black, as they injure the colours much less. We may, however, hence conclude, that for grain scarlets nutgalls are not only useless but very prejudicial; and serving only as an imposition, is a blameable practice, and injurious to commerce.

"The silk is thus suffered to remain in the liquor, in order to make it wholly imbibe the cochineal. During this repose it takes a good half-shade; and the colour yellowing in proportion, gives it a much finer cast.

"One would be apt to believe, that leaving the silk to boil in the liquor for a longer time would have the same effect; but experience proves the contrary: besides, it would be more expensive, considering that it would be necessary to continue the fire.

"The cochineal leaves on the silk, when taken out of the liquor, a kind of scale, or rather the skin of the insect, which always contains a portion of the colouring juice. In order, therefore, to cleanse the silk perfectly from this kind of bran, it is twice beetled when washed at the river. By this means the colour becomes more brilliant, clearer, and fuller.

"The two beetlings before dyeing are necessary, because the silk having been strongly alumed for this colour, and intended to boil in the dyeing liquor for a great while, would, without this precaution, yield a certain quantity of the alum, which not only injures the colour, but likewise prevents the perfect extraction of the cochineal; for generally all neutral salts added to the dyeing liquor have more or less this inconvenience.

"The grain, or cochineal crimson, such as described, is not only a very beautiful, but may be considered as a most excellent colour: it is the most permanent

of all dyes for silk. It perfectly resists the boiling with soap, and evidently suffers no alteration from either the sun or the air. Silk stuffs of this colour, commonly used in furniture, are sooner worn out than faded. It is frequently seen that the colour of this grain crimson in furniture, though more than 60 years old, is scarce impaired. The only observable difference occasioned by time is, that by losing the yellow cast it becomes rather darker, approaching nearer to the violet."

The dyeing of cottonred is attended with much more difficulty than any of the substances hitherto mentioned; and indeed to produce a good scarlet or crimson upon it has hitherto been a desideratum in the art. The following are M. Apigny's directions for dyeing such reds as are commonly in use. "It is necessary, previous to the dyeing of cotton thread, to cleanse it from that unctuous matter by which the dye is prevented from penetrating its pores. For this purpose they make use of four water; which is prepared by throwing some handfuls of bran into hot water, and letting it stand 24 hours, or till the water becomes sour, when it is fit for use. These four waters, however, cleanse the cotton but very imperfectly, carrying off only the superficial part of the unctuous matter, which river water would do as well. The lixiviums of ashes are more effectual; and therefore all fixed alkalis, particularly kelp, or even the ashes of new wood, are, for the reason I have already given, generally preferred for this operation. The salts are extracted in the same manner as by the bleachers; and the cotton is then steeped in these lixiviums, which, like the silk, is inclosed in a clean linen pocket or sack, to prevent the skeins from tangling: it should boil for a couple of hours: when perfectly cleansed, the pockets sink to the bottom of the liquor, because the impeding matter being removed, the water penetrates the pores. The pocket is then taken out of the copper, the skeins separated from each other, and washed at the river. They are afterwards wrung on the peg, and again rinsed till the water comes off clear. The skeins are then spread on the perches to dry.

"To dye cotton red requires three preparations, viz. cleansing, galling, and aluming. The operation of cleansing as above.

"With regard to the galling, any kind of galls may be used in case of necessity; or even tan may be substituted; but that requiring more, it would not answer the purpose so well. The black Aleppo galls, because less suffices, are preferable to the white galls, which though cheaper make the expence come nearly equal. The Aleppo galls are, however, liable to dull the colour, which though easily revived, the white not producing this inconvenience, are generally preferred by most dyers. It requires nearly five quarts of liquor to drench one pound of cotton; so that for 20 pounds, five pounds of pounded galls are boiled in about 120 quarts of water; it should boil for two hours, or till by pressing it between the fingers it breaks easily.

This liquor is drawn off clear, and poured into a tub, into which, when cold, or even whilst warm, the cotton, which was before divided into hanks of about eight ources each, and tied with a thread to prevent them from tangling, is dipped. Suppose, for example, that having about 40 of these hanks, and 100 quarts of the gall liquor; a part of it necessarily evaporates

⁵⁸ Of dyeing cotton of a red colour.

rating in the boiling, five quarts of this liquor is taken out of the tub and put into a trough, into which you dip two skeins at once, carefully working them till they are soaked. They are then taken out and laid in an empty tub, pouring over them the remainder of the liquor in which they had been soaked: five quarts more are then taken out of the tub containing the gall water, poured into the trough, and two more hanks dipped into it, and so on successively till the whole is galled. The gall liquor should be stirred in the tub every time you take out, that the whole of the cotton may be galled equally, which it would not be were the grounds to settle at the bottom. This operation finished; if any of the liquor remains, it is poured on the galled cotton, being orderly ranged in the tub; where, after remaining 24 hours, it is taken out skein by skein, gently wrung, and then put to dry.

"The aluming for the cotton consists of about four ounces of Roman alum for every pound of the substance. Having pounded the proper quantity of alum, it is dissolved over the fire in a copper containing a sufficient quantity of water, taking care not to let it boil, otherwise it would lose its strength. The liquor is immediately poured into a tub or trough of cold water, proportioned to the quantity of the cotton, so as that the whole of the liquor may be as that of the galling, 100 quarts for every 20 pounds of cotton. It is the custom to add to this alum liquor a solution partly composed of arsenic and white tartar, with one part of the lixivium of kelp. The first solution consists of one grain of arsenic and two grains of white tartar, in two or three quarts of water. When the water in the copper boils, the arsenic and tartar, well pounded, is put into it, and kept boiling till the liquor is reduced to about half. When cold, it is strained and put into bottles or vessels, which should be stoppered and kept for use.

"The kelp lixivium is made with about half a pound to a quart of water. You will know if this lixivium be sufficiently strong, when by putting an egg into it the point only appears on the surface.

"You then add to the alum liquor for this supposed 20 pounds of cotton 20 quarts of the solution, and three quarts of the said lixivium, observing nevertheless that the whole of the water used in mixing the alum and other substances be always in the proportion of five quarts of liquor to every pound of cotton. The 20 pounds of cotton are then plunged into this astringent pound by pound, in the same manner and with the same precaution as in galling; it is afterwards wrung, but without being too much squeezed, and then slowly dried.

"Some dyers never use the solution of tartar and arsenic with the alum, rationally supposing that these substances, as they rust and yellow the red colours, would be prejudicial to the dye: the red furnished by madder, being already too much inclined to this shade, requires rather to be saddened; and for this reason partly the kelp lixivium is added to the aluming. Several, therefore, use six quarts of this lixivium instead of three; and these six quarts containing the salts of about three pounds of kelp, which by supposing the kelp ashes to contain a quarter of its weight of salt, is in proportion of half an ounce to every quarter of a pound of alum.

"Instead of the solution of tartar and arsenic, others

make use of a solution of sugar of lead, prepared separately. It should be observed in this particular, that when the sugar of lead is dissolved in common water, it becomes turbid and whitish, because plain water not dissolving this perfectly, a kind of partial separation of the calx of lead takes place; but by mixing a sufficient quantity of distilled vinegar with the water, the calx entirely disappears and the solution is complete.

"When the cotton is taken out of the astringent, it is lightly wrung on the peg, and dried. The more slowly it dries, and the longer before it is maddered, the brighter the colour. Twenty pounds of cotton are generally dyed at the same time; but it were still more advantageous to dye only 10, because when there are two many hanks to work in the copper, it is very difficult to dye them equally, the hanks first immersed having time to take a great deal of colour before the last are put in; for as the first cannot be returned upside down till after the last are plunged, it is morally impossible that the dye should be even.

"The copper in which this ten pounds of cotton are dyed should contain about 240 quarts of water,—that is, 20 quarts of water for every pound of cotton; its shape should be an oblong square, and about two feet deep. It should also be wider at top than at bottom; the difference, however, should not be too great, because in that case the hanks laid slanting on the sides would be liable to spot. As several dyers have erred for want of knowing how much water the copper should contain respecting its dimensions, and as the greater part of the braisers are likewise ignorant in this particular, it may not be amiss, in this place, to add a short and easy method of finding the contents of a vessel.

"In the first place, suppose the vessel round or cylindrical, you begin by measuring the diameter; you then seek the circumference, afterwards the surface; and at last, by multiplying the surface by the perpendicular height, the product is the cube sought for, and determines the contents of the vessel.

"For example, a copper 22 inches deep by 30 diameter; to find the surface, take the proportion of the diameter to the circumference, which is as 7 to 22: state as in the Rule-of-Three, the first number 7, the second 22, and the third 30; the fourth number will be the circumference. This fourth number is found by multiplying the two middle numbers, 22 and 30, by each other, and dividing the product 660 by 7, the first number; the quotient 94 is the circumference sought for. If a square or oblong vessel, as in the present case, you have the circumference by adding the length of the four sides.

"Multiply afterwards the half of the circumference by the radius, that is 47 by 15, the product 705 is the number of square inches, and consequently the surface of your vessel.

"At last multiply 705 by 22, which is the perpendicular height, the product 15510 is the number of cubic inches your vessel contains. If it is larger at top than at bottom, it is necessary, in order to determine the circumference, to take a middle number between the breadth of the top and the breadth of the bottom, as if the copper be 33 inches at the top and at bottom 27, the middle number and real diameter is 30.

"Having multiplied the surface by the perpendicular height, you must reduce the inches to feet. Now

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the square foot being equal to 144 square inches, and the cubic foot to 1728 cubic inches; you must therefore in this example divide 15510 by 1728, the quotient $9\frac{1}{4}$ will be about the number of cubic feet in the copper; and as a cubic foot contains 35 quarts, consequently the copper contains 318 quarts Paris measure. (The Paris pint is our quart.) To madder 10 pounds of cotton, a copper containing 248 quarts of water is made hot. When it is rather too hot for the hand, six pounds and a quarter of good Dutch grape madder is put into it, and carefully opened and diffused in the liquor. When it is well mixed, the cotton, which had been previously passed on the rods and suspended on the edge of the cotton, is dipped into it hank by hank. When it is all dipped, the hanks on each rod are worked and successively turned upside down, beginning from the first that was put in, and so proceeding to the last; returning to the first, and thus continuing without intermission for three quarters of an hour, always maintaining an equal degree of heat, but without boiling. The cotton is then raised and drawn out upon the edge of the copper, and about a pint of the kelp lixivium poured into the liquor. The rods are then passed through the threads by which each hank is bound, and the cotton put back into the copper and boiled for about 12 or 15 minutes, keeping it entirely immersed during that time. It is at last raised, gently drained, wrung, washed at the river, and wrung a second time on the peg.

"Two days afterwards the cotton is a second time maddered, about eight ounces of madder to every pound; that is, five pounds of madder added to the dyeing liquor. The cotton is then worked in it in the same manner as in the first maddering, with this difference, that none of the lixivium is added, and that the liquor is made of well-water. This maddering being finished, and the cotton cooled, it is washed, wrung, and dried.

"To brighten this red, you put into a copper or trough a quantity of warm water sufficient to drench the cotton, pouring into it about a pint of the lixivium. In this liquor you immerse the cotton pound by pound; leaving it in for an instant only, when it is taken out, wrung, and dried.

"On this operation it ought to be observed, that the method of dyeing in two liquors has no advantage. For, besides that it consumes more time and wood, the second maddering cannot furnish much dye, considering that the astringent salts are exhausted by the boiling of the first maddering; consequently that the cotton, when deprived of these salts, cannot take the dye. I propose therefore another method now pursued with success by several dyers: it consists in giving the cotton two aluminings, and afterwards dyeing in one liquor only. By this means it takes the dye much better, and acquires more depth, because the whole of the madder turns to advantage. With respect to brightening, it is a needless operation for red cotton destined for the fabrication of callico; because the colour is brightened after it is woven, by dipping in warm water sharpened with a little of the lixivium. When the cotton is taken out of this water, if washed at the river and spread on the grafs, the red brightens much better than by any other operation.

"The reds hitherto mentioned are vulgarly called
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madder reds, though those I am going to describe are equally obtained from a species of madder coming from the Levant. The latter, however, commonly called *kuary*, furnishes a dye incomparably finer than that produced by the best Zealand madder: it is, however, the fashion to call the red of madder the first dye, and the Adrianople red the second. The process of the latter I shall give in this place.

"When you have 100 pounds of cotton to dye, you put 150 pounds of Alicant soda, inclosed in clean linen, into a tub. This tub should be full of holes at the bottom, that the liquor may run into another tub underneath. The 150 pounds of soda being in the upper tub, is covered with 300 quarts of river-water, measured by wooden pails containing each 25 quarts. The water that passes from the first tub into the second is again poured over the soda at different times, till it has extracted all the salt. This lixivium may be tried with oil: if it uniformly whitens, and mixes well with the oil without any appearance of separation at the surface, it is then sufficiently saturated with the salt. It may be also tried with a fresh egg, as I have said above. You again pour 300 quarts of water over the soda contained in the superior tub, in order to extract the whole of the salt. Two similar lixiviums are afterwards made, each with the same quantity of water as had been used for the soda, *viz.* 150 pounds of fresh wood-ashes, and the other with 75 pounds of quicklime. These three lixiviums being clarified, 100 pounds of cotton are put into a tub, and watered with each of these lixiviums in equal proportion. When it has perfectly imbibed these salts, it is put into a copper full of water without being wrung, and boiled for three hours: it is afterwards taken out and washed in running water. This operation being finished, the cotton is dried in the air.

"A quantity of the above-mentioned lixiviums is then poured into a tub in equal portions, so as to make 400 quarts. In a part of this liquor, 25 pounds of sheep's dung, with some of the intestine liquor, is well diluted by means of a wooden pestle, and the whole strained through a hair-sieve. Twelve pounds and a half of good olive-oil poured into this mixture, when finished, instantly forms a soapy liquor. In this the cotton should be dipped, hank by hank, stirring every time, and with the same precautions I have already recommended in the aluming of cottons destined for the madder red. The cotton having remained 12 hours in this soapy water, is then taken out, lightly wrung and dried. This operation is repeated three times. The liquor that runs from the cotton when wrung falling again into the trough where the cotton was laid is called *jection*, and should be kept for brightening.

"When the cotton has been three times dipped in this soapy water, and afterwards dried, it is again dipped three times in another composition, made in the same manner as the first, with 400 quarts of lixivium and 12½ pounds of oil, but without the sheep's dung: the remainder of this liquor is also preserved for brightening. The cotton having been dipped in this liquor three times with the same precautions, and left in it the above-mentioned time, it is then carefully washed at the river to dislodge it entirely of the oil, without which the aluming would not take effect. Having been washed,

washed, it should be as white as if it had been bleached.

"When dry, you proceed in the aluming, which is done twice successively; but it is needless to give a detail of what has been sufficiently explained in the article upon madder red. It is enough in this place to say, that the galls, about a quarter of a pound to every pound of cotton, should be pulverized; that six ounces of alum should be put to the first aluming; for the second four ounces; and at last, that an equal quantity of the lixivium be added to the alum-water. We must also observe, that it were best to make an interval of three or four days between each aluming; and that no other astringent be added, all metallic salts being in general injurious to the beauty of the colour.

"Some days after the last aluming, you proceed to dyeing in the same manner as above, only using two pounds of lizy in powder for every pound of cotton; and, before you dye, adding to the liquor about 20 pounds of liquid sheep's blood. It should be well struck into the liquor, which should be carefully skimmed.

"In order to brighten the colour, the cotton is dipped in a lixivium of fresh wood ashes, dissolving in it five pounds of the best white Marseilles soap; the water should be warm before the soap is put into it. In this mixture the 100 pounds of dyed cotton is immersed, and worked till it becomes perfectly penetrated. Six hundred quarts of water are then put into another copper; and when warm, the cotton, without squeezing it out of the first, is put into the second, and boiled for three, four, five, or six hours, over a very slow fire, but as equal as possible, carefully covering the liquor to keep in the vapour, that none may escape but what passes through a funnel of small reeds.

"Some pieces of the cotton are taken out from time to time; and when sufficiently revived and washed thoroughly, the red is perfect. The cotton may be also brightened in the following manner: when washed and dried immediately after dyeing, it should be soaked in the sicciori for an hour, well squeezed, and also dried. When dry, you dissolve for every 100 pounds of cotton 5 pounds of soap in a quantity of water sufficient to cover the cotton. When the water is warm, the cotton is immersed; and having well imbibed, is put into a copper with 600 quarts of water. The whole is boiled very slowly during four or five hours, keeping the copper covered to prevent the steam from going off. This second method makes the red much brighter than the finest Adrianople carnation.

"The process just described was practised at Darnetal, and in other manufactories of France, according to instructions communicated by a person who had seen this process in Turkey. But whether his observations were inaccurate, whether he concealed a part of the mystery, or whether the success of the operation depended on the concurring circumstances accompanying the various mixtures, I know not. Few, however, by closely observing this process, have hitherto obtained a red either so permanent or so beautiful as the red of Adrianople, and those who have succeeded think it but just to reap the advantage of their secret.

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On this subject, however, several not unuseful reflections may be advanced.

"First, the manner of purging the cotton indicates that this process is capable of damaging considerably, and of rendering the cotton very brittle, owing to the sharpness of the lixivium in which it is steeped, so burning in its nature as to make holes in the legs of the workmen who tread it with their feet. It is therefore more simple and less dangerous to cleanse the cotton in six quarts of lixivium to every pound of substance, and containing only six ounces of kelp for every six quarts; to boil the skeins in it afterwards, inclosed in clean linen pockets.

"By this method the cotton would be sufficiently cleaned without being spoiled; the kelp may be even reduced to half the quantity, substituting in its place double its weight of fresh wood ashes, which would answer quite as well.

"Secondly, that the failure of many dyers is owing to their not sufficiently divesting the cotton of the oil, which prevents both the galling and aluming from taking effect. The mixture of the lixivium and oil not being well made, or the lixivium being too weak, the oil forms with it but an imperfect combination. This oil therefore, separating and swimming on the surface of the lixivium, sticks to the cotton, which it greases, and by obstructing the pores prevents the gall from penetrating. Great attention therefore should be given to the lixivium, in order to extract all the salt of the kelp, and to use quicklime, which is absolutely necessary to render this lixivium caustic; a quality without which the oil cannot possibly form a combination with the alkali, consequently can make no soap.

"In Europe the oil of olives is substituted instead of the oil of sesamum, which is used in the East-Indies and in Turkey; but the nature of these oils makes no difference in the operation. The oil of sesamum differs from the oil of olives only because it is thicker, consequently nearer to the nature of animal fat or wax; but the conclusion resulting from this difference is, that less of it may be required than of the oil of olives. Were the oil of sesamum absolutely necessary, it might have been easily procured. The sesamum is a species of fox-glove that grows in the Indies; but is cultivated in Italy, and especially in Sicily, where it is called *giurgulena*. The same kind of oil may be obtained from plants analogous; such as the gratiole the henbane, &c. but the plant whose seed resembles it most is the convolvulus or lizeron.

"It is certain that the process brought from Adrianople might be greatly abridged; but we must leave the secret to those to whom it belongs; and I am besides convinced, that a memoir on this subject will be presented to the Academy of Sciences, and therefore will not anticipate.

"With regard to the sheep's dung and intestinal liquor, it is of no use in fixing the colour. But we know, that these substances contain a large quantity of volatile alkali quite developed, which has the property of roving the red colours. If the bones of animals owe to their tenacious gluten the faculty of retaining so strongly the madder colour, the vivacity of this colour may be attributed, as from experience we

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learn, to their volatile alkali. It were absurd to imagine that the Europeans only had discovered this phenomenon; as it may be rationally supposed, that the Indians, having perceived it by accident, sought to imitate what chance had brought to their knowledge. It is certain, that in the red dye of the Maroquins, the process of which was brought from the Levant, they prepared the goat skins for dyeing with dog's excrement, having found it effective in exalting the dye of the lac.

"In the dyeing of cotton thread, it is common to mix the sheep's dung with a lixivium of fixed alkali; by which the volatile principle of the dung is retained, and consequently putrefaction prevented. By dipping the cotton several times in this soapy liquor, it is impregnated with the predominating alkaline principle; and we know by experience, that substances once impregnated with volatile alkali, for example, chemical vessels used in extracting it for a long time, retain a smell very like the smell of musk, even after having been well scrubbed with sand, ashes, soap, &c. Every time the cotton is dried when taken out of this liquor, the evaporation of the aqueous particles (the alkaline principles being changed into earth) produces a stronger adhesion in the pores of the cotton. From the union of this earth with a portion of the oil employed, a mastic is the result, which is afterwards completed by the alum; and this, in a word, is the theory of the fixity of this colour.

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"Linen thread may be dyed in the same manner; only that, previous to its being purged like the cotton thread, it is usual to boil it in water, adding for every pound of thread a quarter of a pound of chopped forrel. Oil of vitriol is, however, more convenient and better than forrel. But I refer my reader to what I have already said upon the article of thread; observing only, that by this process the linen thread always takes less dye than the cotton, owing to the difference of their pores.

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Method of
dyeing
crimson in
the Eastern
countries.

The following processes were taken from the manuscripts of M. Hellot. "According to the letters of M. Grange, correspondent of the Royal Society, who died at Schiras in Persia, June 1737, the dyers of the city of Damas dyed their crimson colour, so beautiful and so much esteemed in the east, in the following manner: Take ten *rottes* (a rotte weighs five pounds) of silk in skins; wash it well in warm water; then let it soak in a sufficient quantity of hot water during half an hour; squeeze out the water; dip it afterwards, but once only, in a hot lixivium, made with a sufficient quantity of water, half a *rotte* of kelp ashes for every *rotte* of silk, which is immediately drained on rods, taking care not to leave the silk longer in the lixivium than is necessary for its being well soaked, lest the alkali should corrode it.

"Whilst the silk drains, they prepare another liquor cold, with ten ounces of the pulp of yellow melon, very ripe, which is uniformly diffused in a sufficient quantity of water. They steep in this liquor the ten *rottes* of silk for twenty-four hours; they increase or diminish the quantity of the above drugs in proportion to the quantity of the silk to be dyed. The silk having remained one day in this melon liquor, is several times washed in fresh water till it becomes perfectly

clean; they then hang it to dry. Mean while the workmen fill a large pan of water, adding a half *rotte* of alum powdered for every *rotte* of silk. The pan is then suspended over a hot furnace, and the liquor boiled during twenty minutes; after which the fire is taken from the furnace. The silk is then dipped in this alum solution, moderately hot, and again taken out as soon as it is perfectly wet. They then put it into another pan, pouring over it the alum solution, in which it remains four or five hours, but no longer. It is then taken out and several times washed in fresh water.

"Whilst the silk is washing, a workman fills a large pan with water, adding an ounce of *baïfonge* (a fungus), finely powdered, for every *rotte* of silk; when this new decoction has boiled for half an hour, they add ten ounces of *oudez* (cochineal), very finely powdered, for every *rotte* of silk; that is, six pounds four ounces of cochineal for ten *rottes* of silk. As soon as this cochineal is added, the fire is taken from the furnace. The liquor is then gently stirred round with a stick; and when the mixture is perfectly made, they pour gently and by inclination a little fresh water into the middle of the pan. The water thus added not only cools the dye, but makes it much more lively. They then immediately dip the silk four or five times, wringing after every dip. This tincture is afterwards boiled again for about a quarter of an hour, and the fire is then taken from the furnace as before. When the liquor is a little cool they dip the silk, still observing to wring after every dip. This done, they put the silk into an empty kettle, pouring over it the remainder of the dye, in which it is left to soak for twenty-four hours. It is then well washed in clean water, dried in the shade, and when very dry wove into stuffs. This crimson is much superior to all the French and Italian crimsons; because the silk was never boiled in the dye.

"The dyers of Damas and Diarbequir say, that they could not accomplish this dye without the pulp of the yellow melon in the preparation, or without the *baïfonge* used with the cochineal in the dye. According to M. Grainge, we have this melon in France; but he doubts concerning the *baïfonge*, which is a species of fungus growing on trees in some parts of Persia, from whence it is brought to Damas, and might also be sent into France by the way of Aleppo, were we desirous of imitating this excellence in the crimson dye.

"To avoid mistakes in the quantity of the different ingredients employed in this process, it may be necessary to repeat, that a *rotte* of silk weighs five French pounds, and that the ten *rottes* of silk, produced as an example in this memoir, should also serve as a standard with regard to the quantities of the other ingredients.

"As to the water necessary for the preparation of the silk with the kelp, melon, and the alum for the dye, it requires no more than a sufficient quantity for wetting the silk, namely, about a finger's breadth over it, differing from the tincture, which, as the skins are dipped in this liquor at least ten or a dozen times, should be fuller in the kettle.

"The kali used in the preparation of the silk is nothing more than the ashes of a plant called by the
Arabs

Arabs *kailou*. These are preferable to the ashes made from the *rouquet*, or thofe made in Egypt.

"The frames ufed for thefe filks are fimilar to the frames ufed at Lyons.

"At Genoa the filks defigned for crimfon are boiled in a much lefs quantity of foap than thofe intended for any other colour, 18 or 20 pounds ferving for a hundred pounds of filk in the crimfon dye; for any other colour, the Genoefe ufe 40 or 50.

"When the filk is boiled, it is dipped in the alum liquor; and to a quantity of raw filk, weighing 72 pounds, they put from 16 to 18 pounds of roch alum, finely powdered, into a copper full of cold water. When the alum is perfectly difsolved, the filk is put to foak in it for near four hours: it may remain longer without any inconvenience, filk intended for crimfon requiring more alum than for any other colour. When taken out of the alum liquor, it is thook and dreffed on the pegs, but without wringing. One of the dyers being queftioned why the filk was not wrung when taken out of the liquor? answered, that it would purge it too much from an impregnation fo abfolutely neceffary for its taking the crimfon dye.

"Of the 72 pounds of filk already mentioned, 32 pounds is *organzine*, and the remaining woof. At Genoa it is the cuftom to allow two ounces of cochineal to twelve of *organzine*, if defigned for the warp of damask furniture, and for the fame filk an ounce and three quarters of cochineal for 12 ounces of the woof, fuppofing it neceffary to the beauty of the filk that the warp fhould be fuller than the woof; and to bring the colour of the damask to fill more perfection, they add to the *organzine* a quarter of an ounce of cochineal, that is, inftead of two ounces they add two ounces and a quarter, adding no more to the woof than one ounce and three quarters.

"As the above 32 pounds of *organzine* fhould be of the fineft colour, they allow two ounces and a quarter of cochineal to every pound of filk; fo that upon the whole they ufe 142 ounces of cochineal, or 11 pounds 10 ounces, Genoa weight; namely, 32 pounds of *organzine* to two ounces and a quarter of cochineal, making 72 ounces; 40 pounds of woof to one ounce and three quarters, making 70 ounces. Total, 142 ounces.

"In order to dye this 72 pounds of filk, alumed as above, they make ufe of an oval copper containing when full 200 quarts of water; they fill this copper two-thirds full of clean fountain water, adding afterwards the following drugs pound and fifted. Two ounces of tartar, two ounces of *faffranum*, and two pounds and a half of the Levant galls.

"They wait till the drugs have boiled two minutes in this liquor; after which they add the 11 pounds 10 ounces of cochineal finely powdered and fifted; and whilst one of the workmen by degrees makes it fink to the bottom, another keeps violently ftirring the liquor with a ftick to promote the folution.

"This done, they fill the vefel with clean water to about a foot of the edge, immediately afterwards dipping the 32 pounds of *organzine*, divided on 14 rods. They let it remain till the vefel which they fill with clean water, and under which they put a large

fire, is ready to boil; they then, to make the filk take the colour more evenly, raife the rods without ceafing, one after another, that each may alternately reach the bottom of the copper, which being but two-thirds full, the upper part of the filk would elfe remain out of the liquor, the rods being fupported on the edge of the copper.

"When the liquor was ready to boil, the forty pounds of woof, divided on 18 rods, were dipped; they ftill continuing to raife the rods, one after another, for half an hour, both the *organzine* and the woof, that each may alternately reach the bottom; fo that when the workman came to the laft he returned to the firft, and fo on fucceffively.

"After the firft half hour, they ftopped for a quarter of an hour between every operation, the workmen ftill raifing the rods from the firft to the laft, five or fix times repeated in the fpace of an hour and an half; all the time keeping a good fire under the copper. The *organzine* was then fteeped in this liquor two hours and a quarter, and the woof only two hours. The fire was then taken from under the copper; and the workman taking out one dip of the *organzine* and another of the woof, he wrung and dried them as much as he could to fee if the colour was what he wifhed; if not fufficiently deep for the purpofe, he let them both remain in the liquor fomething lefs than half an hour whilst the liquor was growing cold. He then took out all the filk, wrung it on the peg, then wafhed it feveral times in clean water, changing the water every time. This done he wrung it again on the pegs, and fo finifhed the operation.

"It muft be obferved with regard to the *organzine* and woof, that though dyed in the fame liquor, they were not however of the fame fhade at the conclufion of the operation; the *organzine* was deeper, having been a quarter of an hour longer in the cochineal liquor, during which time it was impregnated with the more fubtle colouring particles of the cochineal.

"At Genoa it is not the cuftom to wafh the filk out of the cochineal with foap water; on the contrary, they are perfuaded that this practice dulls the brightness of the colour, and that the water, both for the cochineal liquor and for wafhing afterwards, fhould be the fineft fpring-water: for they remark, that the crimfon dyed in fummer with ciffern water, is by no means fo bright as the crimfons dyed at other feafons when the fountains are full.

"According to the dyers of Genoa, there is a kind of cochineal which though apparently beautiful, is not fo in effect; that in ufig this cochineal it is neceffary to alum the filk as much as poffible, and to add to it more tartar than before mentioned. It is, however, impoffible to give any certain rules concerning this matter; the dyer himfelf will judge of the quality of the cochineal fit for ufe. He fhould however ufe the belt; for were it even a fact that the inferior kind, with the affiftance of a greater quantity of alum and tartar, gives a colour equal to the belt, the filk thus weakened by alum would neceffarily be always lefs perfect. The Genoefe manufacturers are fo well convinced of this, that they themfelves furnifh their dyers with cochineal in proportion to the filk given to be dyed."

65
Analysis of
the sedi-
ment re-
maining af-
ter dyeing
scarlet or
crimson.

After the operations of dying scarlet and crimson already mentioned, there always remains a brown sediment in the bottom of the liquor, which is thrown out as useless. This, on being examined by M. Hellot, was found to be a precipitated calx of tin, as he has ascertained by reviving the metal from it, though not without great trouble, so that there can be no advantage in repeating his experiments. The remainder of this sediment was composed of the dregs of the cream of tartar united with the gross animal particles of the cochineal. These last being washed over with water, and thus separated from the earthy and metallic parts, were dried separately, and afterwards bruised with an equal weight of crystals of tartar; after which they were ground to an impalpable powder, and boiled with a little alum. Thus they communicated a fine crimson colour to a pattern of white cloth, from which our author is of opinion, that the custom of reducing cochineal to powder and only sifting it, does not give an opportunity of sufficiently extracting the colour from this valuable material; he therefore gives the following receipt for doing so in a more perfect manner. "To an ounce of cochineal powdered and sifted as usual, he adds a fourth part of its weight of very white, clean, and dry cream of tartar. These being ground together on a marble stone to an impalpable powder, are used both in the preparation and in the dye, omitting the small quantity of crystals of tartar formerly directed for the preparation." The quantity here directed to be put to the cochineal, he thinks, evidently renders the colour more fixed.

66
How to ex-
tract all the
colour from
cochineal.

For madder red the preparation is pretty much the same as for kermes, and is always made with alum and tartar. Dyers are not agreed with regard to the proportions. M. Hellot puts five ounces of alum and one of red tartar to every pound of worsted; adding likewise about a twelfth part of four water, and boiling the wool in this solution for two hours. Worsted is to be kept for seven or eight days moist with this solution; but cloth is finished in four days. A fresh liquor is prepared for dyeing this wool; and when the water is sufficiently hot to bear the hand in it, you must throw in, for every pound of wool, half a pound of the finest madder, carefully stirring and mixing it well in the copper before you put in the wool, which is to be kept in for an hour; but without letting it boil, as that would tarnish the colour. Nevertheless, for the dyer's security, it may boil for three or four minutes at the end of the operation; but the more that madder is boiled, the worse is the colour it yields.

67
Of dyeing
yellow.

The third primitive colour spoken of among dyers is that of yellow: and for this M. Hellot observes, that there are ten different ingredients fit for the purpose, though only five of them yield a good and permanent dye. These are weld, savory, green-wood, yellow-wood, and fennugreek.

"Weld or wold generally yields the truest yellow, and is therefore preferred to all the others. Savory and green-wood, being naturally greenish, are the best for the preparation of wool to be dyed green; the two others yield different shades of yellow.

"The shades of yellow, best known in the art of dyeing, are straw colour, pale yellow, lemon colour, and full yellow. The common orange colours are not

simple, and therefore we shall not speak of them at present.

"For dyeing worsted and stuffs yellow, you make ⁶⁸Worsted or use of the usual preparation, viz. of tartar and alum, ⁶⁸woollen stuffs. You allow four ounces of alum to every pound of wool, or 25 pounds to every 100. With regard to the tartar, one ounce to every pound is sufficient for yellow, though it requires two for red. The method of boiling is similar to the preceding. For the welding, that is to say for yellowing, when the wool or stuff has boiled, you make a fresh liquor, allowing live or six pounds of weld to every pound of stuff; some inclose the weld in a clean woollen bag to prevent it from mixing in the stuff; and to keep the bag down in the copper they put on it a cross of heavy wood. Others boil it in the liquor till it has communicated all its colour, and till it falls to the bottom; the stuff is then suspended in the net, which falls into the liquor; but others, when it has boiled, take out the weld with a rake, and throw it away. They sometimes mix yellow wood with this weld; and some dyes mix any of the other ingredients before specified, according to the shade required. By varying the proportions of the salts for the preparation, the quantity of the colouring ingredients, and the time of boiling, it is possible to produce an infinite variety of shades.

"For regular shades of light yellows you proceed as for all other regular shades, only that light yellows require a weaker preparation. For example, 12 pounds and a half of alum to 100 pounds of wool is sufficient. The tartar should also be diminished, because the wool is always wasted a little by the preparation, and that when you require only light shades they may be as easily obtained by a weaker preparation; thus you save all in the expence of the salts. But these light shades do not so well stand the test as the darker shades, which are dyed with the full proportion of tartar. Some dyers suppose that by letting their wool and stuff remain longer in the dye, they remedy this evil; because they imbibe the colour more slowly in proportion to the weakness of the decoction: if you put wool into the dye, differently prepared, it will in the same time imbibe different shades. These weaker preparations are called *half preparations* or *quarter preparations*, and require great attention, especially for light shades of wool when dyed in the fleece for the manufactory of cloth and mixt stuffs, because the wool is harder and more difficult to spin in proportion to the quantity of alum in the preparation; the stuff is consequently less fine. This observation is not, however, of much importance with regard to worsteds for tapestry, neither with respect to stuffs; but it is not much amiss were it only to show that the quantities of the ingredients used in the preparation are not so very exact; but that they may be varied without any risk, whether to give to the same shades to wool prepared in different preparations, or whether to make but one preparation, if more convenient for different shades.

"In order to dye with yellow wood, it should be split, or rather shaved with a joiner's plane: by this means it is more divided, consequently yields better, so that a smaller quantity will do. Prepare it as you will, it should always be tied up in a bag, to prevent it from mixing with the wool, and from tearing the

stuff. The savory and green-wood, when used instead of weld, in order to vary the shade, should be included in the same manner.

"To the above mentioned ingredients for dyeing yellow we may here add the root of dock, the bark of ash, especially the second bark; the leaves of the almond tree, peach, and pear tree; in short, all astringent leaves, barks, and woods. These will produce good yellows, more or less fine according to the time they have boiled, and in proportion as the alum or tartar predominates in the preparation. A larger quantity of alum makes it almost as fine as the yellow of weld; if the tartar prevails, the yellow has more of the orange; but if these roots, barks, or leaves, boil too much, the yellow terminates in shades of fawn colour.

"Though several dyers are accustomed for the good dye to use turmeric, a root imported from the East Indies, and which produces an orange yellow, it is however blameable; because the colour very soon fades, at least if not fixed with marine salt, as practised by some dyers who carefully conceal this art. Those who use it for common scarlet, in order to save cochineal, and to give a lively orange red, are also reprehensible; for scarlets dyed in this manner very soon lose their bright orange cast, which darkens by the air. We are, however, obliged in some degree to tolerate the deception; for this flaming colour being so much in vogue, it were impossible to produce it otherwise but by increasing the quantity of composition, the superabundant acid of which considerably injures the cloth."

69
To dye silk
of a yellow
colour.

For dyeing silk of this colour it should have about 20 pounds of soap for every 100 of stuff; and after boiling with this ingredient, it should be washed, alumed, and washed again (which is called *refresching*), when it is to be put upon the rods in hanks of about seven or eight ounces, and then dipped and returned in the yellow liquor. The finest yellow for silk is weld; and the process, as delivered by M. Macquer, is as follows:

"A copper is prepared with about two pounds of weld to every pound of silk; and that all the weld may be well soaked, it is loaded with a large piece of wood. When it has boiled a good quarter of an hour, the bunches are pushed to the far end of the copper, or rather, if you please, taken out; and by means of a bucket or ladle all the liquor may be taken out of the copper, and strained into a copper or wooden trough; that is, by putting a sieve or linen cloth across a trough; by which means the liquor is cleared from all the grain and little straws left by the weld in boiling. The liquor thus strained is left to cool till you can bear your hand in it: the silk is then dipped and returned till the colour becomes uniform. If this boiling does not make sufficient to fill the trough, it must be supplied with water, which should be added before the liquor is cold, that the degree of heat already mentioned may be preserved. In general, all dyeing vessels should be full, that the silk when dipped may be only two inches from the edge.

"During this operation the weld is a second time boiled in fresh water; and when it has boiled, the silk should be raised at one end of the trough, either up-

on a kind of barrow, or upon the edge of the trough. Half the liquor is then thrown away and replenished by adding of the second boiling as much as was taken from the first, observing to rake and mix the liquor well: such is generally the method when any new addition is made; at least if the contrary is not particularly specified. This new liquor may be used rather hotter than the first; it should nevertheless be always of a moderate heat, because otherwise it would destroy a part of the colour which the silk had already taken, probably owing to the silk being deprived of part of the alum by the heat of the liquor. The silk is returned in this fresh liquor as at first; mean while you prepare a solution of pearl-ash in proportion of about one pound to every twenty pounds of silk.

"For this purpose the pearl-ash is put into a copper, and the second liquor, quite boiling, poured on it, stirring in order to assist the dissolving of the salt. This small liquor is left to subside, and the silk is a second time raised on the barrow or trough, throwing into the liquor about two or three ladles of the clearest of the solution. The liquor is then well raked, the silk replunged, and again returned. This alkali develops and brightens the yellow of the weld. After seven or eight returns, one hank is wrung to try if the colour be full enough and sufficiently bright; if deficient, a little more of the solution of the ashes must be added, and the remainder of the silk done in the same manner till it has taken the shade required. The lixivium, separately prepared, may be added, if you will, at the same time with the second boiling of the weld-liquor; care should be taken however that the liquor be not too hot. This operation is only for yellows, nor would the liquor do for greens.

"For yellow still fuller, approaching to jonquil, when the pearl-ash is added, it may be also necessary to add some rocou, in proportion to the shade required.

"For the light shades, such as pale lemon or Canary-bird, they should be boiled in the same manner as for blues, these shades being much more beautiful and transparent when dipped in a clear ground. To do this, when the weld is ready to boil, some of the liquor should be taken out and mixed with a little clean water and a little of the liquor of the vat if boiled without azure. The silk is then dipped as usual; and if deficient in shade, the weld liquor must be re-added, and the dipping repeated, if necessary, to complete the shade required.

"For deeper lemon colours the weld should boil as for yellows, adding only a certain quantity with clean water, according to the fulness of the shade required: some of the liquor of the vat may also be added if necessary; but these dark lemon colours may be boiled in the common way as for yellows. It must be observed, however, that the blue of the vat is never added to these colours but when it is intended to give them a greenish cast.

"These very pale yellow shades are rather difficult, as they are very frequently liable to be affected by the air, and to deepen too much while drying. This happens when alumed in the common way, which is too much; but this inconvenience may be avoided, if in-

stead of aluming as for other yellows, a separate liquor is prepared, or even without any particular preparation, only a little alum put into the liquor of the weld.

"In manufactories where they cannot easily procure weld, they make use of the grains of Avignon, and precisely in the same manner; but it gives a less permanent colour."

To dye cotton yellow.

Cotton to be dyed of a yellow colour should be first well cleaned in a lixivium of fresh wood ashes, and afterwards well washed and dried. Another liquor is then prepared by dissolving in the water, when ready to boil, about a quarter the weight of the substance to be dyed of Roman alum. The skeins are plunged into this alum liquor, returning them on the rods for some minutes. When equally penetrated throughout, the threads by which the skeins are tied being passed on the rods, the hanks are laid on the trough containing the alum liquor. The copper or trough is then covered, it being sufficient to keep the liquor hot without boiling. The cotton, having been thus infused for 24 hours, is then dried, but without washing. We must observe, that the longer it remains dry, the better it takes the colour, and that the washing may be even dispensed with previous to the yellow dye.

A strong weld liquor is afterwards prepared, adding for every pound of the substance to be dyed a pound and a quarter of weld. The cotton or thread, having been previously alumed, is then immersed; the boiling checked with cold water, and the substance worked till it has taken the shade required.

The whole when dyed is plunged into a very hot liquor, but not boiling, made of blue vitriol, a quarter of a pound for every pound of the substance. When it has remained for about an hour and an half, the whole, without washing, is thrown into another liquor composed of about a quarter of a pound of white soap for every pound of the substance. Having been well worked and the threads opened, it should boil for three hours or more if you think proper. The soap might be diminished to half the quantity, but the full proportion does better. This operation finished, the whole is well washed and dried.

If you desire a dark or jonquil yellow, neither the linen nor cotton should be alumed; but for every pound of thread should be added two pounds and a half of weld. When it has been dipped and well worked in this liquor till it has taken the colour equally, it is raised above the liquor, and half a pint of the kelp lixivium poured into it, made as directed in the article upon red. The thread is then returned upon the rods, dipped in this liquor; where having remained for a full quarter of an hour, it is taken out, wrung, and dried.

The lemon yellow is done after the same manner, only that for every pound of thread you put but one pound of weld, diminishing the verdigris in proportion, or even omitting it entirely by substituting in its place the alum liquor. By this means the yellow shade may be varied *ad infinitum*, and without any difficulty; in brightening and fixing the colour, however, the above method must be always observed.

Cotton-velvet is dyed with the root of a plant called *cureum* or *terra nigrata*, a species of rush which comes

from the East Indies. It gives a beautiful yellow colour; but if dyed in the common manner, has but little solidity. This colour, according to M. de Apligny, may be fixed upon cotton or linen thread by dipping them in a solution of sulphur of antimony in the kelp lixivium already mentioned. When treated in this manner, it is very beautiful as well as permanent.

The fourth primitive colour so called among the dyers, is that which bears the appellation of *fawn* or *root* colour. It is however a kind of brown, and has the name of *root-colour* from being an ingredient in a great number of others. The process for dyeing it is different from those lately described; the wool requiring no other preparation than that of being soaked in water, as already directed for blue. The materials for dyeing it are the green shell of the walnut, the root of the walnut tree, the bark of the alder, fantal, fumach, roudoul or fovic, and foot.

The green shells of the walnut, collected when the nuts are perfectly ripe, and put into tubs or calks, and afterwards filled with water, are in this manner preserved till the year following. The shells are also used before the nuts are ripe; but these should be saved apart, in order to be first used; because, as the soft shell which adheres putrefies, it will keep but for two months only.

The fantal or faunders is a hard wood imported from the Indies, generally ground into a very fine powder, and preserved in bags; because it is supposed to ferment, by which it is thought to be greatly improved; but our author has never observed any difference. This ground wood is generally used with one third of cariatour wood; by which, in the opinion of those who prepare it for sale, it is much improved. It is however nothing like so good as the walnut shells; because, if used in too large a quantity, it diffuses considerably, and thereby injures the wool; hence it were best not to use it, either for wool or fine stuffs, except in the lighter shades, where it would not have so bad effect. It is generally mixed with galls, alder bark, and fumach, as by this means only you can obtain its colour when not mixed with the cariatour. It yields but very little with the preparation of alum and tartar, especially if it be not chipped; but notwithstanding these defects, it is used on account of the solidity of its colour, which is naturally a yellow red brown. The air makes it deeper, and soap lighter. It loses but little by a trial of alum, and still less by tartar.

Of all the ingredients for dyeing fawn colours the walnut rind is the best. Its shades are finer, its colour solid; and by making the wool flexible, renders it less difficult to work. It is prepared in the following manner. You fill a cauldron half full of water, and when it grows warm, you add rinds in proportion to the quantity of stuffs to be dyed and to the colour required. It is then boiled; and when it is boiled for a quarter of an hour, the stuffs, having been previously moistened with warm water, are dipped; they are then turned and well stirred, till they have imbibed the colour desired. If for workeds, requiring an exact assortment of shades, you put less walnut rinds, and begin with the lightest shades. You put more walnut rinds in proportion as the colour is exhausted, and then dip the darkest shades. With regard to stuffs, you

generally begin with the deepest, and as the colour of the dye diminishes, you dip the lightest. They are aired as usual, dried, and dressed.

The root of the walnut tree is, next to the husk, the best dye for fawn colour: it also gives a very great number of shades, nearly resembling those of the husks; hence they may be substituted for each other, but the root requires a different process. You fill your cauldron three quarters full of river water, putting in the root, cut small, in proportion to the quantity of wool to be dyed, and to the shade required. When it is very hot, you dip the wool or stuff, turning and returning it as before, remembering to air it from time to time; and, if stuff, to draw it through the hands in order to shake off the small bits of the root, which might else spot the stuff. To avoid these spots, the root should be tied in a bag. You afterwards dip the lighter stuffs, and so on, till the colour of the root is exhausted. If worked, you always begin with the lightest, as for other colours; but of all things you must be careful to keep your liquor from boiling at the beginning, as in that case the first piece of stuff would imbibe all the colour.

⁷²
Precautions
to be used
in dyeing
with roots.

The method of dyeing with roots is not very easy; for if you are not very attentive to the degree of heat, to turning and returning the stuffs or worked, so as to dip them equally, you run a risk of their being either too dark or spotted, for which there is no remedy. In this case, the only resource is to dye them marone, prune, or coffee colour. In order to avoid this evil, you must keep the stuffs continually turning on the reel, and dip them only piece by piece, nor let the liquor boil till the root has yielded all its colour. The worked or stuffs dyed in this manner, should be aired, well washed, and dried.

Nothing more can be said concerning the bark of alder, than what has been already observed with respect to the root of the walnut tree, only that letting it boil at the beginning is not of so much consequence, because it yields its colour less freely. It is generally used for workeds and colours darkened with coppers. It nevertheless produces a good effect on wool not intended for colours extremely dark, and perfectly withstands the power of the air and sun.

Sumach is nearly of the same nature, and used in the same manner as the husks: its colour is not so deep, and is rather greenish. It is for dark colours frequently substituted for nut galls; but a greater quantity is requisite. Its colour is also perfectly solid and permanent. These different substances are sometimes mixed together; and as they are equally good, and produce nearly the same effect, there is no great difficulty in obtaining certain shades. We must, nevertheless, be directed by custom in the production of these fawn colour shades, which absolutely depend upon the eye, and which are not difficult to manage.

With regard to the mixing of these ingredients with ground fantal, you put four pounds of the latter into the copper, half a pound of nut galls pounded, twelve pounds of alder bark, and ten pounds of sumach (these quantities will dye 25 or 27 ells of cloth). The whole is boiled; and having checked the boiling with a little cold water, you immerse the cloth, turning and re-
turning it for two hours: it is then taken out, aired,

and washed in the river. You afterwards dip some more stuff in the same decoction, if you want a lighter shade; and in this manner you may contrive as long as the liquor retains any colour. The quantities of these ingredients are augmented or diminished in proportion to the depth of the shade required, letting the wool or stuff boil accordingly.

Here we shall describe also the manner of dyeing ⁷³Of dyeing with foot. though it has less solidity than the others, with foot. and has also the property of hardening the wool, and giving the stuff a very disagreeable smell.

The foot and water is generally put into the copper at the same time, and the whole well boiled. The stuff is then immersed, and more or less boiled according to the shade required; it is afterwards taken out and cooled, and those intended for the lightest shade are then put in; they are afterwards well washed and dried. But the best method is to boil the foot in the water for two hours, to let it stand afterwards, and then to empty the liquor into another copper, without mixing the foot. The wool and stuffs are then dipped in the liquor, and are thereby less hardened than if they had been mixed with the foot: but this does not render the colour more permanent; and indeed it were better never to make use of this ingredient, except for stuffs of little value, especially as it can be supplied by other ingredients already mentioned, and which give a better and more lasting colour, and are besides more softening to the wool. In the dye they frequently employ the green walnut shell, and the root of the walnut tree for their fawn colours. These two substances are useful both for the greater and lesser dye: there are, however, places where it is difficult to meet with them, and where they are therefore obliged to make use of faunders and even of foot.

The last of the primitive colours so called by the ⁷⁴Of dyeing dyers, is black; which includes a vast number of black. shades, from the lightest grey or pearl-colour to the deepest black. Hence it is ranked among the primitive colours in dyeing; for among dyers the word *primitive* does not denote *simplicity*, but only being the original colour from whence a number of others are derived. In order to dye woollen stuffs of a good black, they should first be dyed of a mazarine blue as deep as possible; which is called the *basis* or *ground*, and is to be performed in the manner already directed. The stuff ought to be washed well in running water as soon as it comes out of the vat; and afterwards scoured at the fulling mill; which operation is of the utmost consequence, because without it the subsequent colour will be greatly injured by the lime in the liquor for dyeing blue. This being done, the colour is finished in the following manner. For 100 pounds of cloth put into a cauldron of a moderate size, ten pounds of logwood, cut into chips, and ten pounds of Aleppo galls pulverised, the whole enclosed in a bag: these ingredients are boiled in a sufficient quantity of water for 12 hours. A third part of this liquor is emptied into another cauldron, with two pounds of verdigris; the stuff is then entered and turned for two hours without ceasing. It is necessary to observe that this liquor should boil very slowly, or it is still better to keep it very hot without boiling. The stuff is then taken out, and the second third of the liquor thrown into the copper to the first third, with the

addition of eight pounds of copperas. The fire under the cauldron is diminished, and the copperas left to dissolve for half an hour, letting the liquor cool, after which the stuff is kept turning an hour; it is then taken out and cooled. The rest of the liquor is then mixed with the two first thirds, carefully squeezing the bag well. To this is added 15 or 20 pounds of fumach: you give it another boil, and then cool it with a little water; having previously added two pounds more of copperas, you again turn the stuff for two hours; it is then taken out, cooled, and again put into the cauldron, turning it constantly for an hour longer. After this it is carried to the river, well washed and scoured at the fulling mill. When it is thoroughly scoured, and the water comes out of it clear, you prepare a fresh liquor with as much weld as you think proper; you give it one boil, cool it, and dip the stuff. This last decoction softens and confirms it a very fine black. For the most part, however, they do not take so much pains; but are satisfied, when the cloth is blue, to dip it in a decoction of nutgalls, and to let it boil for two hours. It is afterwards washed, and some copperas and logwood added to the liquor; after which the stuff is again dipped for two hours, and then washed and scoured.

It may be also dyed in the following manner: for 15 cloths of cloth, previously dyed blue, M. Hellot had a pound and a half of yellow wood, five pounds of logwood, and 10 pounds of fumach, put into a cauldron. In this the cloth boiled for three hours; after which it was taken out, and 10 pounds of copperas thrown into the copper. When the copperas was dissolved and the liquor cooled, the cloth was put into it for two hours; it was then taken out and cooled, after which it was again immersed for an hour, and then washed and scoured: it was tolerably fine, but not so velvety as the preceding.

75.
Experiments
to determine
whether
maddering
be an advantage
in this colour.

It was commanded by the ancient French regulations, that stuffs should be maddered after they had been blued, and before they were dyed black. Desirous of ascertaining the advantage resulting from this process, our author took a bit of cloth which had been dyed blue; this being divided, one half was boiled with alum and tartar, and afterwards maddered. It was then blackened in the same liquor with the other half which had not been maddered, conformable to the first of the two methods just described. They were each of them a very beautiful black; it nevertheless appeared that the maddered stuff had a reddish cast: the other black was certainly more beautiful, more velvety, and much finer. There is, indeed, less danger of the maddered stuffs soiling the hands and linen, because the alum and tartar of the preparation had carried off all the loose particles. This advantage is not however sufficient to make amends for the inconvenience of maddering, as the stuff is always in some degree injured by the alum and tartar, and as the madder gives it a reddish cast disagreeable to the eye, and besides this operation raises the price of the dye to no purpose.

Some dyers, to avoid these inconveniences in part, madder their cloth without having previously boiled it in alum and tartar. But madder used in this manner has no permanency.

N^o 106.

Black is sometimes dyed without having given it the blue ground; and this method of dyeing is used for light or thin stuffs of inferior value, consequently not considerable enough to bear the expense of a deep blue previous to their being dyed black. It is however proper at the same time to give these stuffs a ground of the green walnut shell, or of the root of the walnut-tree, to avoid the necessity of blackening them with too great a quantity of copperas.

This process is attended with no manner of difficulty. The cloth is prepared with the green walnut shell, and afterwards blackened in the manner already described, or as near it as possible. For with black, as with scarlet, most dyers suppose that they are possessed of a secret for dyeing a much finer black than any of their fraternity; this, however, consists in augmenting or diminishing the quantities of the same ingredients, or in substituting others which produce the same effect. M. Hellot has tried several methods; but supposes that what is strictly meant by succeeding to perfection, depends rather on the manner of working, handling, and airing the stuff properly, than upon the exact quantity of the ingredients.

It may not in this place be improper to explain the ⁷⁶reason of the necessity of giving stuffs a blue, or at least a root colour ground, previous to their being dyed black; and why the dyeing white black is expressly prohibited in France; because in that case it is necessary to use a much greater quantity of nutgalls: this would indeed be no great evil, as nutgalls of themselves do not injure the wool; but in order to overcome this gall, according to the workmen's phrase, that is, to blacken it, or properly speaking rather to form an ink on the stuff, it requires a greater quantity of copperas, which not only hardens the stuff, but, from the acidity impressed on the fibres of the wool by this salt, makes it brittle: on the contrary, when the stuff has had a ground, that is to say, a strong layer of some deep colour, there is much less occasion for either.

Blue is preferable to any other colour; first, because it is the nearest to black, which is in fact only a deep blue; and, secondly, as there is no occasion for any other preparation than previously boiling the wool, the stuff is in no respect injured. For the same reason, viz. the preservation of the wool, the root colour is substituted for inferior stuffs instead of the blue, which would enhance the price; it is therefore necessary that this root-colour ground should be as deep as possible; because the darker it is, there is occasion for less copperas to complete the black.

It also frequently happens, that when stuffs of any colour are badly dyed or spotted, they are dipped in black: it is however advisable to dip them first in blue, unless the colour be very dark, in which case they would take a very fine black; but this is the last resource. These stuffs are not commonly dyed black, if it be possible to make them any other colour; because, having been prepared with alum and tartar for the first colour, the copperas requisite for the black would considerably injure and greatly diminish their quality.

The shades of black are greys, from the darkest to the lightest. They are of great use in the art of dye-dye grey ing, as well for their own colours simply as when applied

⁷⁶Why it is necessary to dye the stuffs blue.

⁷⁷How to dye-dye grey colours.

plied to other colours, which is called *darkening*. At present we shall mention two methods of producing them. The first and most general is to boil some pounded nutgalls with a proper quantity of water for two hours; at the same time dissolving some copperas in a little water separately. Having prepared a caudron of liquor sufficient for the quantity of wool or stuff to be dyed, you add to it, whilst the water is too hot for your hand, a little of the decoction of the nutgalls with the solution of copperas. The stuff intended for the lightest grey is then dipped. When sufficiently coloured according to your desire, you add some fresh decoction of nutgalls with some of the infusion of the copperas, and then dip the next shade. In this manner you proceed to the darkest shade, constantly adding these liquors, from the tawny grey even to black; but it is much better to give the tawny grey and the extreme dark shades a blue ground, more or less as you like, for the reason above mentioned.

The second method of producing grey seems to be preferable; because the juice of the galls is better incorporated with the wool, and you are thereby sure of using no more copperas than is absolutely necessary. It even appears that the greys are more beautiful and the wool brighter. It also appears to be equally solid; for they are both of them equally proof against the air and sun. The second method is much less prejudicial to the quality of the wool, and is attended with no more difficulty than the first.

You boil a sufficient quantity of nutgalls, well pounded and inclosed in a clean linen bag; you afterwards put the wool or stuff into this liquor, letting it boil for an hour, moving and stirring it about, after which it is taken out. You then add to the same liquor a little copperas dissolved in a part of the solution, and then dip the woollens intended for the lightest shade. You again add a little of the copperas solution, continuing in this manner as in the first operation till you come to the darkest shades. In either process, if not restrained by patterns, you may catch the precise shades, beginning with the dark and finishing with the light, in proportion as the liquor becomes exhausted of its ingredients; keeping the pieces of stuff or wool immerged for a longer or shorter time, till the stuff takes the colour desired.

It is as impossible to determine the quantity of water necessary for these operations, as it is to specify the quantity of the ingredients, or the time for letting the wool remain in the liquor. The eye must judge of these things. If the liquor be strongly impregnated with colour, the wool will imbibe the shade in a short time; but, on the contrary, it must remain longer if the liquor be exhausted. When the wool is not dark enough, it is dipped a second time, a third, or even more, till it is of a sufficient colour; the only necessary attention is to prevent the water from boiling. If it be by chance too deep, the only remedy is to dip the stuff in a fresh warm liquor, adding to it a little of the decoction of nutgalls. This liquor carries off a part of the precipitated iron of the copperas; consequently the wool or stuff becomes lighter.

But the best way is to take it out of the liquor from time to time, not leaving it in long enough to imbibe

more of the colour than required. It may also be dipped in a solution of soap or alum; but these correctives destroy a great part of the colour, so that it is often necessary to darken it again; by this means the wool, which suffers greatly by the reiterated action of these ingredients, is injured. All greys, however dyed, should be well washed in a large stream, and the darkest even scoured with soap.

These dingy shades, from the lightest to the darkest, are produced by the same operation from which common ink is obtained. The green vitriol contains iron; were it blue, it would contain copper. Pour a solution of this green copperas into a glass, holding it in the light and dropping into it some of the decoction of nutgalls. The first drops that fall into this limpid solution of ferruginous salt produces a reddish colour, the next turns it bluish, then a dusky violet colour, and at last it becomes a dark blue, almost black, which is called ink. To this ink add a quantity of pure water; let the vessel rest for several days, and the liquor by degrees becomes clearer and clearer, till it is almost as limpid as common water, and at the bottom of the vessel you will perceive a black powder. Having dried this powder, put it into a crucible; calcine this, and put to it a little suet or any other fat, you will obtain a black powder which may be attracted by the loadstone. This, therefore, is iron; this is the metal which blackens the ink; and this, when precipitated by the nutgalls, lodges in the pores of the fibres of the wool, dilated by the heat of the liquor, and contracted when the stuff is exposed to the air. Besides the styptic quality of the nutgalls, by which they have eminently the property of precipitating the iron of the copperas and producing ink, they also contain a portion of gum, as may be ascertained by evaporating the filtered decoction. This gum being introduced into the pores with the ferruginous atoms serves to retain them; but this gum being easily soluble, it has not the tenacity procured from a salt more difficult of solution; therefore these dark colours have not the solidity of other solid colours prepared in a boiling solution of alum and tartar, and therefore plain greys have not been submitted to the usual trial.

It is by no means easy to produce a good black colour on silk, though the basis is undoubtedly the dye silk of same, viz. iron dissolved by acids, and precipitated on the cloth by a vegetable astringent. The following process is given by M. Macquer. "Twenty quarts of vinegar are put into a trough with one pound of black nutgalls pounded and sifted, and five pounds of fresh iron-slings. While the infusion is making, you clean out the copper in which you put the black ground, with the following drugs pounded, viz.

8 lb. of black nutgalls	3 lb. of agaric
8 — of cummin	2 — of coque de Levant
4 — of sumach	10 — of buckthorn
12 — of pomegranate rind	6 — of linseed.
4 — of bitter apple	

"These several drugs are put into a copper, containing half the quantity of the vessel used for the black ground, and filled with water. Twenty pounds of Campeachy or logwood chips are afterwards inclosed in a linen bag, for the convenience of taking them out

of the liquor, unless you choose to take them out with a pierced ladle, or any other means, because these must boil a second time as well as the other drugs.

"When the logwood has boiled for about a quarter of an hour, it is then taken out and properly preserved. The above-mentioned drugs are then put into the logwood decoction, and also boiled for about a quarter of an hour, carefully checking with cold water as often as it seems ready to boil over.

"This operation being finished, the liquor is strained through a linen strainer into a trough, and then left to settle, carefully preserving the grounds which must be again boiled.

"The cold infusion of the vinegar with the nutgalls and iron filings is then put into the copper intended for the black ground. The fire is afterwards put under it, and the following ingredients immediately added, viz.

20 lb. of gum arabic pound- ed	2 lb. of green copperas
3 — of realgar or red arsenic	2 — of the scum of su- gar candy
1 — of sal ammoniac	10 — of powder sugar
1 — of sal. gem.	4 — of litharge pound- ed
1 — of mineral crystal	5 — of antimony
1 — of white arsenic	2 — of orpiment
pounded	2 — of plumbago.
1 — of corrol. sublimate	

These several drugs should be pounded and sifted, except the gum arabic, which is only broken.

"Instead of gum arabic the native gums may be used, and dissolved in the following manner: Some of the logwood decoction is put into a boiler; when hot, you put into it a copper strainer, made in the shape of an egg, and open at the largest end. The gum is put into this strainer, and dissolves as the liquor heats; it must be stirred with a wooden pestle, that it may pass through the holes. When it is entirely passed, you introduce another copper strainer, with holes still smaller than the former, to prevent the impurities of the gum from escaping. The liquor of the gum already dissolved is poured into this strainer, and again passed as before by the help of the pestle. This operation is made more easy, by now and then taking out the strainer and resting it on a cross shelf or plank, suspended on the peg over the copper used for winging the black. The gum must be squeezed pretty hard with the pestle to force it through the holes of the strainer.

"The gum would dissolve with more facility if previously steeped for three or four days in the logwood decoction, especially if you are careful to pour it on very hot.

"When the above ingredients are put into the black ground, you must remember to keep the liquor hot enough to dissolve the gum and the salts, but it should never be suffered to boil; and when it is therefore sufficiently hot, the fire is taken away, and the fresh iron filings sprinkled over it in a proper quantity to cover the liquor.

"The next morning the fire is again put under the copper, the drugs boiled, and the logwood a second time boiled. It is then taken out, and the following drugs added to this second decoction, viz.

2 lb. of black nutgalls	6 lb. of pomegranate rinds
pounded	pounded
4 — of fumach	1 — of bitter apple
4 — of cummin	2 — of agaric pounded
5 — of buckthorn ber- ries	2 — of coque de Levant
	5 — of linseed

These drugs are boiled, the liquor strained and poured on the black ground as we have already said, and the grounds preserved. You then put a little fire under the copper as at first, and the following drugs are immediately added, viz.

8 oz. of litharge pounded	8 oz. of rock salt
8 — of antimony pound- ed	8 — of fengreek
8 — of plumb de mer, also pounded	8 — of corrosive subli- mate
8 — of white arsenic	8 lb. of copperas
pounded	20 — of gum arabic, pre- pared as above
8 — of crystal mineral	

"When the liquor is hot enough, you take away the fire, stirring over the liquor with the iron filings, and letting it stand for three or four days.

"Two pounds of verdigris are then pounded and dissolved with six quarts of vinegar in an earthen pot, adding to it about an ounce of cream of tartar. The whole should boil for a full hour, taking care to check the boiling with cold vinegar that it may not boil over. This preparation should be kept ready to be added to the black ground when you are going to dye.

"For the black dye the silk is boiled as usual; having washed and beetled according to custom, you give the gall liquor for heavy blacks twice, but for light blacks only once. These two blacks are alike both in beauty and shade, differing only in the weight of the silk: the light black has, however, rather more lustre.

"The nutgall liquor is made as follows: For every pound of silk you must have three-quarters of a pound of light nutgalls, adding the same quantity of Aleppo. These galls are pounded together, and boiled for two hours in a quantity of water sufficient for the whole of the silk to be galled. As the liquor wastes a great deal in the boiling, it is, after the first hour, filled again, and after two hours the fire is taken away; the liquor is then left to deposit, and the galls taken out with a pierced ladle; about an hour afterwards the silk is put into it, prepared as above.

During this operation the silk is drained and very lightly squeezed: it is then immersed in the gall liquor, on cords one above another, taking care to keep it near the surface of the liquor, but sufficiently covered. In this manner it should remain 12 or 15 hours; it is then taken out, washed at the river, and if intended for heavy black, is a second time galled in a fresh galling like the first; the grounds are generally used for the first galling; but for the second a liquor of fresh drugs.

"Some dyers gall the heavy blacks but once, by boiling the old grounds, taking them out immediately, and afterwards adding fresh galls; for every pound of silk a pound of light gall and half a pound of fine Aleppo. The fresh galls they boil for two hours or more, and when the grounds are taken out they put the

the filk in the fresh gall liquor, where they let it remain a day and a night.

" This method, they say, is the best; because, were the gall grounds to remain in the liquor, they would re-imbibe part of the subtilance which they had before given to the water.

" When the filk is galled, a little fire is put under the black ground; while it is heating, the filk is wrung out of the galling, and beetled at the river.

" When washed it is drained on the pegs, passing a thread round every hank, each hank as large as for common colours: it is then immediately put on the rods.

" While the black liquor is heating, it should be fired with an iron rake or paddle, to prevent the grounds from sticking to the bottom of the copper. You then dissolve some French gum by the method above described, till it rises on the top in a kind of scum covering the surface of the liquor; afterwards you throw into it two or three handfuls of linseed. You then add half of the vinegar and verdigris preparation with about four or five pounds of coppers; this should be punctually repeated at every heating.

" Care should be taken whilst the fire is under the copper to rake; and, to try if it be hot enough, the rake is moved round at the bottom of the copper; if the gum sticks to the rake, and the liquor does not appear through the middle of the gummy scum, it shows that it is hot enough: the fire is then taken away, because, as we have before observed, it should not boil. The rake is then also taken out, and the liquor covered with iron-filings in the same manner as before; after this it is suffered to subside for about an hour, when the surface of the liquor is again fired, in order to precipitate the filings to the bottom.

" Before we explain the manner of dipping filk in the black liquor, it is proper to observe that filk-dyers never dye black but by coppers, that is when they have a sufficient quantity of filk for three dips, if for heavy black; but if light black only two dips, which is done in the following manner:

" If heavy black, a third of the filk is put upon the rods, and three times returned in the black ground; it is afterwards wrung on the peg over the copper; this is done by giving it three twists: in this manner three hanks may be wrung at once, because it should be done gently, and only to drain; it is again put on the rods, and suspended between two perches to air.

" While the first filk is airing, the second third part is dipped in the same manner, and afterwards the third third part, always in the same manner. It must be remembered, that while the filk is on the rods it should be turned from time to time to give it air.

" When the last third part is wrung, the first part is put in, and then the two others successively for three times, always airing at each time. This is commonly called giving the three wrings, and these three wrings are called one fire or heating.

" The light blacks should also have three wrings to one fire.

" After each fire the black ground is again heated, adding coppers and gum as before. This operation is three done for the heavy blacks, that is three fires, each fire consisting of three wrings; but for light blacks only twice, each also consisting of three wrings.

" It must be observed, that at every reheating it is requisite to change the order of dipping, in such a manner that each may in its turn have the first of the liquor. If the black dye is strong and good, the heavy blacks may be done with two fires only; and for the light blacks one wringing less may do for each heating.

" When blacks are finished they are returned in a trough of cold water by dips one after another, called by the French dyers *disbrader* or rinsing; they are then twice or thrice beetled at the river. When washed you put them on the cords, only taking care not to press them too much.

" The filk when taken out of the black dye is extremely harsh, which is by no means wonderful, considering the number of acids and corrosives in the composition. It is therefore necessary to soften it in the following manner:

" Dissolve about five pounds of soap in two buckets ⁸⁰ of water; and while the soap is dissolving, throw in black filk, a handful of aniseed or any other aromatic plant. It should boil till the soap is entirely dissolved. In the mean time a trough should be provided full of cold water, and large enough to dip all the filk at the same time. The soap-water should be strained through linen, the whole mixed well together, and the filk put in, where it should remain a full quarter of an hour. It is then taken out, wrung on the peg, and dried as usual. As the quantity of soap can do no harm, too much is better than too little. This softening is very necessary, in order to divert the filk of that rattling and stiffness so prejudicial in the manufacture of black goods.

" To dye black in the raw, the filk should be galled ⁸¹ to dye in a cold liquor of fresh galls, which had been previously ⁸² black in the usually used for the boiled filk. The natural yellow of the filk is preferable for this dye, because the white takes a less beautiful cast.

" Having untied the filk and divided it into hanks of the common size, it is dipped with the hands into the gall liquor. When soaked and a little squeezed, it is strung on cords, eight or ten hanks together.

" They are afterwards put into the cold gall-liquor, one above another, letting even the cords sink in the liquor, where they may remain for six or seven days. They are then taken out and once beetled at the river. As to time, it should remain in the galling according to the strength of the liquor and the quantity of the filk put into it; but however strong it may be, and however small the quantity of filk, it should remain two or three days at least.

" When the filk is washed, it is again strung on the cords and left to drain, after which the cords are put one over the other into the rinsing or black wash, which is of itself sufficient to dye; it will, however, require more or less time according to the strength of the rinsing wash, generally about three or four days. Whilst the filk is thus immersed in the rinsing water, it should be raised with sticks three or four times a day; it is then drained over the liquor, and when drained put on the ground in a proper place, where it is spread and aired, but not dried. This is absolutely necessary to produce the black, else the filk might take a black-grey; this grey would, however, blacken in the air: nevertheless you are thereby enabled to

judge how much of the colour it has taken, and how much it may still want. Should the silk be suffered to dry, it must be again wetted before it is re-dipped, which would be an additional and unnecessary trouble.

"This operation of washing and drying must be successively continued till the silk is sufficiently black.

"The silk in this situation is carried to the river, and twice beetled; after which it is drained on the cords, and then put on the perches to dry without wringing, which would often it too much; for as this kind of silk is designed for gauzes and black lace, care should be taken to preserve its natural stiffness as much as possible.

"To produce black in the raw in the quickest manner, the silk when washed from its galling should be put on the rods and three times returned in the blacking ground; it is then taken out, and put to drain over the vessel containing the black liquor, and then cooled on the rods.

"When drained, it is again twice dipped in the black liquor, drained, and each time cooled as at first. When drained, it is again washed; and the procedure is then the same as for those which had been dyed in the rinsing. This is not, however, the usual method of dyeing black in the raw; because it consumes the black liquor too soon, considering with what avidity the raw silk takes any colour whatever; and besides that a good rinsing is sufficiently strong for dyeing this colour.

"The black dye is weakened and becomes exhausted in proportion to the silk it has dyed; it is therefore necessary to strengthen and replenish, from time to time, by an addition of proper drugs, which is called giving the *brevet* or *composition*.

"This composition is made by putting four or five buckets of water into a copper, and then boiling it with about four pounds of logwood chips. The logwood is then taken out, and four pounds of black buckthorn berries is added with two pounds of pomegranate rind, two pounds of sumach, two pounds of *Coque de Levant*, two pounds of coliquint, two pounds of linseed, and four pounds of cummin.

"These drugs are boiled together for about three quarters of an hour; the fire is then put under the black liquor, when a little more than half boiled, and whilst hot the following drugs are added, viz.

2 lb. of realgar	1 lb. of white arsenic
4 — of antimony	1 — of corrosive sublimate
1 — of gold litharge	1 — of orpiment
1 — of silver litharge	1 — of powder of sulfur
1 — of fal ammoniac	1 — of fuscine
1 — of rock salt	4 — of copperas.
1 — of crystal mineral	

"These drugs, when all pounded, are thrown into the black ground, remembering to stir. When the composition is sufficiently boiled, it is strained in a trough and left to settle; the grounds having subsided, the clear part is added to the black ground. The same grounds are again boiled and preserved for some other time.

"The composition being added to the black liquor, and sufficiently hot, the fire is taken away. The liquor is then stirred over with the iron-silings, and left to settle for two days.

"When the black ground has had a certain number

of additions, and a quantity of sediment collected at the bottom, part of the grounds should be taken out in order to clear the liquor. Thus frequently replenishing, the foundation is always preserved; so that the liquor is never entirely new, but having been once set in a dye-house is set for ever. These liquors are never liable to putrefaction, owing to the great quantity of nutgalls and martial vitriol in the composition, two of the most powerful antiseptics known.

"The most material observation concerning the black dye is, that in general it greatly injures the goods in such a manner that stuffs of this colour, though not inferior in other respects, wear out much sooner than those of any other. This defect may be attributed to the vitriolic acid of the copperas, which is but imperfectly saturated with the iron. Iron combined with any, even vegetable, acid, is capable of producing black with vegetable astringents. It is therefore most probable that this inconvenience might possibly be removed, by substituting other combinations of this metal for the copperas, if it were worth while to make the attempt."

"All kinds of grey, excepting black grey, are produced upon silk without aluming. The silk being washed from the soap and drained on the peg, a liquor is made of fustic, logwood, archil, and copperas. Fustic gives the ground; archil the red; logwood darkens, and the copperas softens all these colours, turns them grey, and at the same time serves instead of alum in extracting them. As there is an infinite variety of greys without any positive names, and produced by the same methods, it would be endless to enter into a detail that would prolong this treatise to so little purpose.

Suffice it to remark here, that in producing a reddish grey the archil should predominate; for those more grey, the logwood; and for those still more rusty and rather greenish, fustic.

In general, when obliged to complete the colour with logwood, it should be used rather sparingly, because it is apt in drying to darken too much, differing in this particular from all other colours.

To give an example of the manner of producing these colours we shall take the nut-grey.

The fustic decoction, archil, and a little logwood, is put into water moderately hot. The silk is then returned, and when the liquor is exhausted it is taken out; and to soften the colour the copperas solution is added. Some dyers for this purpose add the black wash instead of the copperas; the silk is again returned; and if the colour does not appear sufficiently even, some red spots still remaining, it may be concluded that it requires a little more copperas.

It must also be remembered, that as copperas is the general base of all greys, if deficient in quantity, the colour will be apt to change in drying, and to become rough and uneven.

To try if the colour be sufficiently softened, it should be examined; and if it wets easily, after having been wrung on the peg, it wants copperas; but if on the contrary it feels with a little difficulty, the colour is enough softened.

On the other hand, too much copperas stiffens the silk considerably, making it harsh, and even depriving it of a great part of its lustre. To remedy this, the silk

82
Of dyeing
silks grey.

filk when taken out of the liquor should be wrung on the peg, and then immediately washed at the river, which carries off the superfluous copperas.

The black greys, because alumed and welded, make a separate class. When the filk is alumed and cooled at the river, and the weld liquor prepared as for yellows, the filk is returned; and when the liquor is exhausted, a part of it is thrown away, and the logwood decoction substituted in its place. The filk is again returned in this liquor; and when the logwood is exhausted, some copperas may be added in a sufficient quantity to blacken the colour. The filk is then washed, wrung, and finished as usual.

For iron grey, it is necessary to boil the same as for blues. This colour is much more beautiful when laid on a very white ground. It is more used in the manufacturing of stockings than any other colour, therefore generally wrought in shades; that is, many different shades made at the same time.

When the filk is washed and prepared as usual, you make the liquor of river or well water, no matter which; but either must be cold.

If river water, the logwood decoction made with river water is added, sufficient to produce the dark shade required; the filk is then dipped, and when finished it is wrung and hung up. A part of the liquor is then thrown away and replenished with water for the following shades, and so on to the lightest, carefully dividing; that is, preserving an equal distance between the shades.

When all is finished with the logwood, the dark shades are put again on the rods, to be dipped in a new liquor with the addition of copperas; the remaining lighter shades are then dipped in the same liquor, but without the copperas addition: if, however, the second shade is not enough softened, a little copperas must be added. This defect is easily perceived in the dipping, as we have before observed.

When arrived at the lightest shades, care should be taken that the liquor be not overcharged with copperas, which is easily perceived by its having a reddish cast; in which case some of the liquor should be thrown away and replenished with water, too much copperas producing the same effect with regard to these shades as the preceding.

When the liquor is made with well water, the logwood decoction should also be made of well water. This being added to the liquor, the darkest shades are first dipped as in the preceding process. When the filk has sufficiently drawn, it is taken out, and the following shades are then dipped, but without replenishing, the colour being much better and clearer without the river water.

When all the shades are complete, you soften with copperas, in the same manner as above described; the filk is afterwards washed, and if necessary beetled.

To discharge greys, that is when the shades are too dark and too full, you put some tartar pounded in a mortar and sifted into a bucket or small trough; you then pour over it some boiling water. The clearest of this liquor is afterwards put in a trough, and the silks returned in it; by which operation a part of the colour is immediately discharged.

If the filk does not instantly take an equal colour, a little more tartar must be added as above mentioned.

The filk thus discharged of its superfluous colour is once beetled at the river, and afterwards dipped in hot water, without any other addition. This last operation restores in part what it had lost by the tartar; but to try the colour it should be wrung on the peg.

The tartar always destroying some part of this colour, it should be restored with a fresh liquor made for the purpose, and then softened with copperas as usual.

If the filk has been alumed, then the hot water may be omitted after the beetling; the hot water is, however, always of use in removing the harshness occasioned by the tartar.

To discharge iron greys when too dark, they should be sulphured, afterwards beetled at the river, and then again dipped in a fresh liquor similar to the first.

This method of discharging iron greys is preferable to either tartar or lemon juice, these ingredients giving them a ground that does not easily yield even to the boiling with soap, which consequently spoils the colour; whereas the sulphuring almost entirely whitens the filk by totally destroying the logwood.

For greys in the raw, the filk should be as white as for common colours, except the black grey, for which the natural yellow would be no disadvantage. Having soaked the raw filk, the process is then the same for producing these shades as on boiled filk.

Cotton or linn receive a black colour with still ⁸⁴ more difficulty than filk. "The various processes ⁸⁵ of dyeing cotton or linn" (says M. de Aplynny) for dyeing black, agree in the ⁸⁶ sole intention of introducing within the pores of the stuff ferruginous particles dissolved in different menstrua, and of precipitating them on the stuff by means of astringent substances furnished with phlogiston capable of colouring iron black. The best method therefore of succeeding, is to choose a solvent capable of dividing the particles so minutely that the calx may not injure the stuff. Copperas or green vitriol are used in these processes; but the iron it contains is by no means in a state of perfect division, on account of the phlogiston obliquely retained by it, which facilitates its union with the acid without the iron being perfectly dissolved. It is for this reason, doubtless, that a solution of green vitriol in water deposits in lime a species of ochre; which, according to M. Geoffroy, seems to be an extraneous substance. For the same reason the spirit of nitre, saturated with iron, will dissolve still more, by abandoning the grosser particles of what is held in solution, and of which it retains only the phlogiston.

"This being the case, whenever copperas is used in ⁸⁷ Cause of the rottenness frequent in black stuffs" dyeing of black, the stuffs dyed are generally harsh to the feel and considerably damaged; because the gross particles of the iron being only divided, and not dissolved by the vitriolic acid of the copperas, overspill the pores of the stuff into which they had entered, and by their harshness extending the partition of these pores, force them asunder. M. Hellot very well observes, that cloth dyed black without a blue or root ground requires a greater quantity of copperas, by which the stuff is rendered rotten; but I have also remarked, that when dissolving the rust of iron in vinegar, either for yellow or for the black of painted linnens, it is apt to tear in the parts where these colours are applied, particularly if there has been no attention to take off the grosser earth by scumming the solution. To this

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To discharge grey
colours
from filk.

this earth therefore the rottenness of black stuff may be attributed; and not, as vulgarly imagined, to the salt of vitriol, nor to any other burning cause.

"And therefore, in order to render the colour more equal, and the stuffs less damaged, the best method for black is to use a solution of iron perfectly divided. Consequently, as experience daily teaches, those acids which attack the iron too rapidly are the least proper to produce a perfect solution of this metal. Weak acids are therefore preferable; which, notwithstanding their slow operation, penetrate entirely, dividing it into impalpable particles. Black compositions also succeed much better in proportion as the black liquor is older, and consequently the solution of the iron more complete. The manufacturers in India are so truly sensible of this consequence, that many of them preserve their black vats for more than 20 years. In the states of Genoa, Florence, and Naples, every manufacturing city has a place of reserve, called the *Seraglio*, where at the public expence eight or ten vats are continually supported. These vats have been set from 300 to 400 years, more or less; that is, prepared for the dipping of silk designed for black, and requiring only to be supplied with proper drugs in proportion as they are diminished by use. The ground remaining always the same, forms a kind of leaven, by which the fermentation of the necessary additional drugs is assisted.

"The process at Rouen for dyeing linen and cotton thread black, is first to give it a sky-blue ground, and then to wring and dry. It is afterwards galled, a quarter of a pound of galls for every pound of the substance (as for reds); having remained 24 hours in the gall liquor, it is again wrung and dried.

"About five quarts of the black liquor for every pound is then poured into a trough. The cotton is then dipped and worked with the hand, pound by pound, for about a quarter of an hour, then wrung and aired. This operation is twice repeated, adding each time a fresh quantity of the black liquor carefully scummed. It is again aired, wrung, washed at the river, well drained, and dried.

"When this cotton is to be dyed, about one pound of the rind of the alder-tree for every pound of thread is put into a copper and boiled in a sufficient quantity of water during one hour. About half the liquor that had been used for the galling is then added, with about half the weight of the rind of the alder of fumach. The whole is again boiled for two hours, after which it is strained through a sieve. When it is cold, the cotton is dipped in it on the rods, and worked pound by pound; from time to time airing, and returning it into the liquor; where having remained 24 hours, it is wrung and dried.

"For softening this cotton when too harsh, it is the custom to soak it in the remainder of the weld-liquor that had been used for other colours, adding a little of the logwood-liquor. It is then taken out, and instantly plunged into a trough of warm water, into which had been poured about an ounce of the oil of olives for every pound of the substance: it is then wrung and dried.

"M. l'Abbé Mazéas has given a process for the dyeing of linen and cotton thread black, by madding after having prepared with the sickle of the A-

drianople red, galling and dipping in an astringent composed of lime-water and green copperas calcined. This process, though long and expensive, is in my mind no better than those I have just described. In order to obtain a permanent black, it is my opinion that we must still have recourse to the black resulting from a combination of the three primitive colours, until we discover a feculæ capable of yielding a direct black. I shall now describe a process in which I myself have succeeded perfectly.

"To dye linen and cotton thread black by a combination of colours, it is necessary to begin by cleaning the thread as usual by galling, in the same manner as mentioned in the article upon red, aluming afterwards, and then dipping in a weld-liquor. When taken out of this liquor, it must be dyed in a decoction of logwood, to which has been added a quarter of a pound of blue vitriol for every pound of the substance. It is then taken out, washed at the river, wrung, and washed several times, but not wrung hard. It is at last dyed in a madder liquor, about half a pound of this dye for every pound of the substance. It is needless to repeat here the manner of galling, aluming, and welding, &c. having described them above. By this process we may rest assured of obtaining a very beautiful and permanent black, that will not be liable to be discharged, provided that after having been dyed the thread be dipped in a boiling soap-liquor.

"Several different shades of grey are distinguished in the art of dyeing; viz. black-grey, iron-grey, slate-grey, thorn-grey, agate-grey, &c. It is easy to conceive, that grey in general, being a mixture of black and white, its different shades can be obtained only by introducing into the subject a small quantity of matter, by which the rays of light are absorbed in such a manner, that some of the pores not being occupied, reflect all the rays, and present to the eye a grey colour by means of the black particles contained in the intermediate pores. This operation in dyeing is therefore precisely the same as in painting, which produces grey by a mixture of lamp-black and of white lead.

"It would be too tedious, and even superfluous, to describe the different processes for the several greys just mentioned. The dyer will be better able to judge of these shades by his eye than by any particular rules. All that can be said is, that it is the common practice to give a blue ground to black-grey, iron-grey, and slate-grey; but to none of the others. These shades require aluming in proportion to the shade wanted, and are even frequently galled with liquors that had been previously used.

"The thread having been first galled, wrung, and dried, is dipped on the rods in a trough full of cold water, adding an arbitrary quantity of the black liquor and of the logwood decoction. The thread is then worked pound by pound, washed, wrung, and dried.

"It is possible to produce more permanent greys by the two following processes. First, by galling the thread, by dipping in a very weak black vat or liquor, and afterwards madding. Secondly, by dipping the thread in a very hot solution of crystals of tartar, lightly wringing, and then drying. The thread is then dyed in a decoction of logwood. It appears black; but by dipping the thread, and working it attentively in a hot solution of soap, the superfluous dye being discharged,

86
Compositions for dyeing black improved by &c.

87
Rouen process for dyeing cotton or linen black.

88
Process of the Abbé Mazéas.

89
Of M. de Abligny, by a combination of colours.

90
Of dyeing cotton and linen of a grey colour.

ged, it remains a slate-grey, very pretty and very permanent."

91
Of compound
colours.

Having described in such a particular manner the methods of dyeing the primitive colours, there can be very little difficulty in comprehending the management of those which proceed from a mixture of them. But though an infinite number of different shades may be formed from those already mentioned, we are not to imagine that a good colour will be produced by the mixture of any two at random. Thus, though you mix blue and scarlet together in any way you please in order to produce a purple, the colour will neither be good nor uniform, owing to the opposite action of the acid and alkaline ingredients by which these two primitive colours are struck. With crimson the case is altered: for, as we have already seen, that colour is produced in the greatest perfection where volatile alkali is concerned; and therefore the alkaline ingredients of the blue, which can only tend to heighten that property in the other colour, have no such pernicious tendency. From a mixture of blue and crimson, therefore, are produced columbine, purple, amaranth, penny, violet, with innumerable other shades, varying according to the depth of the original colours employed. In all these compound colours, it is necessary to dye the stuff completely of one colour, and then proceed with it for the other exactly as if it had been quite white. In the present case, you must begin with blue; because, though the indigo cannot be hurt by the ingredients necessary for dyeing crimson, yet the cochineal would be very considerably injured by the lime used for dissolving the indigo. Colours of an inferior kind are produced from madder.

92
Purple, &c.

Blue and yellow produce a green, which is always essentially the same; though there are also innumerable shades of it which go by different names, as yellow-green, pale-green, bright-green, grass-green, sea-green, olive-green, &c. &c. These are all dyed by the general method already mentioned, *viz.* a yellow dye super-added to a blue ground; though they differ in some particulars in respect to the various shades above mentioned.

For yellow-greens, M. Hellot directs the stuff to be a fine light blue, boiled with the common quantities of alum and tartar, and then dipped in the yellow dye in order to receive a strong colour, that the yellow may predominate. For those shades called *cabbage* and *parrot greens*, or any others more inclining to blue, it is requisite that the latter should be very deep and the yellow dye weak, or that a smaller quantity of salts should be used in the preparation. This last method, however, is not approved of by M. Hellot; and indeed it is natural to think, that a great quantity of colour with little of the preparation necessary to make it adhere and brighten it, must be much less durable, as well as less beautiful, than one where the colour and preparation are in due proportion to one another.

A very beautiful green will be produced by dipping a deep blue cloth in the decoction of the *virga aurea* Canadensis, provided the stuff after being dyed blue has been boiled in a solution of three parts of alum and one of white tartar. This green is equally permanent with that dyed with weld. A very permanent green is also produced by the bark of the ash-tree, but less beautiful than the other. A duck's-wing

green is produced by using the root of the sharp-pointed dock grossly powdered and in sufficient quantity. For this the stuff must be dyed first of a dark blue; then well scoured, and afterwards boiled in a solution of four parts of alum and one of tartar; and, lastly, it must be boiled full two hours with the other colouring ingredient the dock-root. By this root also many various shades of colour may be obtained from the palest yellow to a tolerable olive; so that our author thinks it is a considerable acquisition in the art of dyeing.

Sea-green is usually dyed, according to M. Hellot, with verdigris; and the following, he says, is the Dutch method of doing it, and which produces a more permanent colour than usually is obtained by means of that ingredient. "Two cauldrons are to be placed at a little distance from each other; in one of which you put two pieces of cloth of 40 or 50 ells in length, with eight or ten pounds of white soap shaved, and which must be perfectly dissolved. When the mixture is ready to boil, the stuff should be immersed, and suffered to boil a full half hour. In the other cauldron you must prepare another liquor; and when that is quite hot, you put into it a clean linen bag, containing eight or ten pounds of blue vitriol, and ten or twelve of lime, each of them well pulverized and mixed together; it being necessary that the mixture should be as accurate as possible. This bag should be moved about in the water, hot, but not boiling, till the vitriol is dissolved. A winch is then to be fixed on in the usual manner; but which ought to be carefully wrapped round with a clean linen cloth very tight and well sewed. One end of the cloth is fixed on the winch, which is then turned swiftly round, that the cloth may pass swiftly from the soap-cauldron into that with the vitriol; and here it is turned more slowly, that it may have time to imbibe the particles of the copper, which by means of the lime were diffused in the liquor by separating and precipitating them from the blue vitriol in which they were contained. The cloth is left in this liquor, which should never boil till the cloth has taken the sea-green colour desired. It is then to be taken out, drained on the winch, and aired by the lifting. It should hang till it is perfectly cold before it be washed at the river. If it touches wood it will be spotted; for which reason, the winch, and every thing of wood over which it must pass, ought to be well covered with linen."

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On examining this process by the principles of chemistry, it appears to be no other than impregnating the cloth with a solution of copper in fixed alkali. It is undoubtedly a mistake to say, that it is done by verdigris; for no verdigris can be formed from blue vitriol, lime, and soap. All that we can say of it is, that it is cloth impregnated with a combination of copper with fixed alkali; which being naturally extremely ready to unite with water, and having very little attraction for the cloth, the latter may be supposed to be painted rather than dyed with it. A much better method, therefore, seems to be that recommended by M. Hellot, of first dyeing the stuff a very light blue, and then giving the necessary yellow with *virga aurea*.

These receipts may serve as specimens of the methods of dyeing all kinds of mixed colours. There are, however, methods of producing both a blue and green from indigo itself, by dissolving it in acids; and

93
Greens.

the

95
Saxon blue
and green.

the colours so produced are called *Saxon blues* and *greens*. Being perishable colours, they are now seldom used; though Mr Wolfe some time ago published a receipt in the *Philosophical Transactions* for preparing them after an improved method. This method, for the blue, was to dissolve indigo in concentrated oil of vitriol by digesting them in the heat of boiling water instead of sand, which had formerly been used, and was apt to spoil the colour. After the solution of the indigo, the liquor may be weakened at pleasure; and any piece of cloth dipped in it will imbibe a dye deeper or lighter according to the quantity of colour it contains. This colour is very beautiful, but apt to prove unequal; and, as has been already said, extremely perishable. For the Saxon green it is necessary to have a yellow from indigo alo, which is obtained by dissolving it in spirit of nitre. Mr Wolfe recommends an ounce and an half of powdered indigo to be mixed with two ounces of spirit of nitre diluted with four times its quantity of water. The mixture is then to stand for a week, and at the end of that space is to be digested in a sand heat for an hour or more; after which four ounces more of water are to be added. The solution, when filtered, will be of a fine yellow colour. Strong spirit of nitre, when mixed undiluted with indigo, is apt to set fire to it; for which reason the water is added. Even in its diluted state, it will froth and run over if the digestion be performed within 24 hours after the mixture; and on this account it is allowed to remain a week in the cold. One part of the solution of indigo in the acid of nitre, mixed with four or five parts of water, will dye silk or cloth of the palest yellow colour, or of any shade to the deepest, by letting them boil a longer or shorter time, adding water as the liquid evaporates. The addition of alum makes the colour more lasting. None of the colour separates in the operation but what is imbibed by the cloth, and therefore this liquid goes very far in dyeing. That part of the indigo which remains undissolved in the vitriolic acid, when collected by filtration and dissolved in spirit of nitre, will dye silk and wool of all shades of brown inclining to yellow.

96
M. de
Apigny's
remarks on
this process.

On the process for dyeing Saxon blue M. de Apigny observes, that there is no real solution of the indigo in the acid of vitriol, but that it is only divided into very fine particles and suspended in the liquor; neither can any alteration be made in it by an alteration in the process. Nor does this make any exception to the general rule in chemistry, that acids dissolve and reddens the blue colouring matter of vegetables; it not being their nature to act upon fecula such as indigo, but upon vegetable juices, the colour of which depends on the salts and essential oil of the plant. For the truth of his assertion he appeals to the appearance of the liquor prepared for dyeing Saxon blue.

97
Materials
for dyeing
less numerous than
might be
supposed.

From the vast profusion of colours which nature exhibits in the flowers which grow every where around us, it is natural to think that the materials for dyeing might be had in the greatest plenty without any necessity of having recourse to foreign countries. But this is far from being the case: for scarce one of our blue or red flowers can be made to communicate any durable colour to cloth; while, on the other hand, almost all the yellow ones may be made to do so. Numerous experiments have been made to determine the plants

N^o 106.

which might be really useful to dyers; and most that have yet been found fit for their purpose in Britain are comprehended in the following list.

YELLOWS.

Bark of buckthorn,	<i>Rhamnus catharticus.</i>
berry-bearing alder,	— <i>frangula.</i>
berberry,	<i>Berberis vulgaris.</i>
plum-tree,	<i>Prunus domestica.</i>
apple-tree,	<i>Pyrus malus.</i>
hornbeam,	<i>Carpinus betulus.</i>
Root of meadow-rue,	<i>Thalictrum flavum.</i>
common nettle,	<i>Urtica dioica.</i>
Herb, saw-wort,	<i>Serratula tinctoria.</i>
bushy hawkweed,	<i>Hieracium umbellatum.</i>
hemp-agrimony,	<i>Bidens tripartita.</i>
gale, or Dutch myrtle,	<i>Myrica gale.</i>
sweet willow,	<i>Salix pentandra.</i>
birch-tree,	<i>Betula alba.</i>
hedge-nettle,	<i>Stachys sylvatica.</i>
spotted arsmart,	<i>Polygonum persicaria.</i>
yellow loosestrife,	<i>Lythamchia vulgaris.</i>
devil's-bit,	<i>Scabiosa fucifera.</i>
kidney-vetch,	<i>Anthyllus vulneraria.</i>
common yellow liver-wort,	<i>Lichen parietinus.</i>
Flowers of St John's wort,	<i>Hypericum perforatum.</i>

RED.

Roots of ladies bedstraw,	<i>Galium verum.</i>
herb woodroof,	<i>Asperrula tinctoria.</i>
forrel,	<i>Rumex acetosa.</i>
tormentil,	<i>Tormentilla erecta.</i>
purple cinquefoil,	<i>Comarum palustre.</i>

PURPLES.

Herb, or tops of wild marjoram,	<i>Origanum sylvestre.</i>
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BLUES.

Bark of the ash,	<i>Fraxinus excelsior.</i>
Flowers of larkspur,	<i>Delphinium consolida.</i>
bell-flower,	<i>Campanula rotundifolia.</i>
Berries of black heth,	<i>Empetrum nigrum.</i>

GREENS.

Herb of ragwort,	<i>Senecio Jacobaea.</i>
cow-weed,	<i>Ocherophyllum sylvestre.</i>
Panicle of brome-grass,	<i>Bromus secalinus.</i>
common reed,	<i>Arundo phragmites.</i>

BLACKS.

Bark of oak,	<i>Quercus robur.</i>
Water horehound,	<i>Lycopus europaeus.</i>

As it is now necessary to give another colour to How to dif-
stuffs which have been already dyed, it is plain, that it charge co-
is as necessary for a dyer to know how to discharge col-
ours as how to make the cloth imbibe them.—Con-
cerning this, it is only necessary to observe, that alka-
line salts are in general the best, and, where the colours
are well dyed, the only means of discharging them. If
a piece of cloth is dyed with logwood, and the colour
struck upon it with alum, that colour will be nearly
discharged by oil of vitriol, or any other strong acid;
but if solution of tin has been employed in striking the
colour, acids have then no effect, and alkalies only can
be employed. Neither will they discharge the colour
totally, but the stuff must be bleached for some time
to get out the remainder. If alkaline salts cannot be
employed with safety to the stuff, it is then impossible
to dye it any other colour than black; unless it be dyed

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a compound colour, of which the original one is a component part.

⁹¹ Concerning the weight that colours give to silk (in which it is most taken notice of, being sold by weight, and a commodity of great price), it is observed, that one pound of raw silk loseth four ounces by washing out the gums and the natural sordes; that the same scoured silk may be raised to above thirty ounces from the remaining twelve, if it be dyed black with some materials. Of all the materials used in dyeing, especially

of black, nothing increases weight so much as galls, by which black silks are restored to as much weight as they lost by washing out their gum; nor is it counted extraordinary, that blacks should gain about four or six ounces in the dyeing upon each pound. Next to the galls, old fustic increases the weight about $\frac{1}{2}$ in 12; madder, one ounce; weld, half an ounce; the blue vats in deep blues of the fifth stall give no considerable weight; neither do logwood, cochineal, nor even copperas, where galls are not used.

D Y S

DYING of Hats. See HATS.

DYING of Leather. See LEATHER.

DYING, or Staining, of paper, wood, bone, marble, &c. See BONE, MARBLE, PAPER, WOOD, &c.

DYNASTY, among ancient historians, signifies a race or succession of kings of the same line or family. Such were the dynasties of Egypt. The word is formed from the Greek *dynastia* of *dyovos*, to be powerful, or king.

The Egyptians reckon 30 dynasties within the space of 36,525 years; but the generality of chronologers look upon them as fabulous. And it is very certain, that these dynasties are not continually successive, but collateral.

DYRRACHIUM (anc. geog.), a town on the coast of Illyricum, before called *Epidamnus*, or *Epidamnus*, an inauspicious name, changed by the Romans to *Durrachium*; a name taken from the peninsula on which it stood. Originally built by the Corcyreans. A Roman colony (Pliny). A town famous in story: its port answered to that of Brundisium, and the passage between both was very ready and expeditious. It was also a very famous mart for the people living on the Adriatic; and the free admission of strangers contributed much to its increase: A contrast to the conduct of the Apollonians; who, in imitation of the Spartans, discouraged strangers from settling among them.

DYSÆ, in mythology, inferior goddesses among the Saxons, being the messengers of the great Woden, whose province it was to convey the souls of such as died in battle to his abode, called *Valhall*, i. e. the hall of slaughter; where they were to drink with him and their other gods *cerevisia*, or a kind of malt liquor, in the skulls of their enemies. The *Dysæ* conveyed those who died a natural death to *Hela*, the goddess of hell, where they were tormented with hunger, thirst, and every kind of evil.

DYSCRASIA, among physicians, denotes an ill habit or state of the humours, as in the scurvy, jaundice, &c.

DYSENTERY, in medicine, a diarrhoea or flux, wherein the stools are mixed with blood, and the bowels miserably tormented with gripes. See *MEDICINE-Index*.

DYSENTERIC FEVER. *Ibid.*

DYSERT, a parliament town of Scotland, in the county of Fife, situated on the northern shore of the frith of Forth, about 11 miles north of Edinburgh.

DYSOREXY, among physicians, denotes a want of appetite, proceeding from a weakly stomach.

DYSPEPSY, a difficulty of digestion.

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D Y S

DYSPNOEA, a difficulty of breathing; usually called *asthma*.

DYSURIA, in medicine, a difficulty of making urine, attended with a sensation of heat and pain. See *MEDICINE-Index*.

DYTISCUS, WATER-BEETLE, in zoology, a genus of insects of the order of the coleoptera; the antennæ of which are slender and setaceous, and the hind feet are hairy, and formed for swimming. There are 23 species, distinguished by their antennæ, the colour of the elytra, &c.

The larvæ of the dytiscus are often met with in water. They are oblong, and have six scaly feet. Their body consists of eleven segments. The head is large, with four filiform antennæ and a strong pair of jaws. The last segments of their body have rows of hairs on the sides; and the abdomen is terminated by two spines charged with the like hairs, forming a kind of plumes. These larvæ are frequently of a greenish variegated brown: they are lively, active, and extremely voracious: they devour and feed upon other water-insects, and often tear and destroy each other. The perfect insect is little inferior to its larvæ in voraciousness, but it can only exercise its cruelty on the larvæ; the perfect insects, like himself, being sheltered by the kind of scaly cuirass with which they are armed. This creature must be touched cautiously; for besides its power of giving a severe gripe with its jaws, it has moreover, under the thorax, another weapon, a long sharp spine, which it will drive into one's fingers by the effort it makes to move backwards. The eggs of the dytiscus are rather large, and are by them inclosed in a kind of silky duckish cod, of a strong and thick texture, in form round, and terminated by a long appendix or slender tail, of the same substance. These cods are often found in the water, and from them are brought forth the eggs and larvæ of the dytiscus. The strength of these cods probably serves the insect to defend their eggs from the voraciousness of several other aquatic insects, and even from that of their fellow-dytiscus, who would not spare them.

Many species of the perfect insect are common in stagnated waters, which they quit in the evening to fly about. They swim with incredible agility, making use of their hinder-legs after the fashion of oars. The elytra of the females are in general furrowed, and those of the male plain: when they first arrive at their perfect state, their elytra are almost transparent, and in many species of a beautiful dun colour, mingled with shades of greenish brown. The best method of

F f catching

Dyspnoea

Dytiscus.

Plate
CLXIV.

Dyvoor. catching them is with a hand-net or sieve; for they are so nimble, and exercise their defensive weapons so often, and with such painful success, to those who endeavour to catch them, that they are very often obliged to let them escape; the easiest way to kill them, is to let them fall into boiling hot water, which instantly destroys them.

DYVOUR, in Scots law; otherwise *Bare-man*: A.

person who, being involved in debt, and unable to pay the same,—for avoiding imprisonment and other pains, makes cession of his effects in favour of his creditors; and does his *dewoir* and duty to them, proclaiming himself bare man and indigent, and becoming debt-bound to them of all that he has. The word is used in the same sense as **BANKRUPT**: see that article; and **LAW N** clxxxv, 11, 12. clxxii. 10, 11, 12, &c.

Dyvoor.

E A C

E.

E A D

E,
Eachard.

E, THE second vowel, and fifth letter of the alphabet. The letter E is most evidently derived from the old character \aleph in the ancient Hebrew and Phœnician alphabets, inverted by the Greeks to this position E, and not from the Hebrew HE. From the same origin is also derived the Saxon *e*, which is the first letter in their alphabet that differs from the Latin one. It is formed by a narrower opening of the larynx than the letter A; but the other parts of the mouth are used nearly in the same manner as in that letter.

It has a long and short sound in most languages. The short sound is audible in *bed, fret, den*, and other words ending in consonants: its long sound is produced by a final *e*, or an *e* at the end of words; as in *glebe, here, hire, scene, sphere, interfere, reverse, sincere*, &c. in most of which it sounds like *ee*; as also in some others by coming after *i*, as in *believe, chief, grief, relieve*, &c. and sometimes this long sound is expressed by *ee*, as in *bleed, beer, creed*, &c. Sometimes the final *e* is silent, and only serves to lengthen the sound of the preceding vowel, as in *rag, rage, flag, stage, bug, huge*, &c. The sound of *e* is obscure in the following words, *even, heaven, bounden, fire, massacre, maigre*, &c.

The Greeks have their long and short *e* which they call *epsilon* and *eta*. The French have at least six kinds of *e*'s; the Latins have likewise a long and short *e*; they also write *e* instead of *a*, as *dicem* for *dicam*, &c. and this is no doubt the reason why *a* is so often changed into *e* in the preter tense, as *ago, egis; facio, feci*, &c.

As a numeral, E stands for 250, according to the verse,

E, quæque ducentis et quinguecentis tenetis.

In music it denotes the tone *e-la-mi*. In the calendar it is the fifth of the dominical letters. And in sea-charts it distinguishes all the easterly points: thus, E alone denotes East; and E. by S. and E. by N. East by South, and East by North.

EACHARD (John), an English divine of great learning and wit in the 17th century, bred at Cambridge, author (in 1670) of *The Grounds and Occasions of the Contempt of the Clergy and Religion inquired into*. In 1675 he was chosen master of Catharine-hall upon the decease of Dr John Lightfoot; and the year following was created D. D. by royal mandate. He died in 1696.

EACHARD (Laurence), an eminent English historian of the 18th century, nearly related to Dr John Eachard. He was the son of a clergyman, who, by the death of his elder brother, became master of a good estate in Suffolk. He was educated in the university of Cambridge, entered into holy orders, and was presented to the living of Welton and Elkington in Lincolnshire, where he spent above 20 years of his life, and distinguished himself by his writings, especially his History of England, which was attacked by Dr Edmund Calamy and by Mr John Oldmixon. His "General Ecclesiastical History from the Nativity of Christ to the first Establishment of Christianity by Human Laws under the emperor Constantine the Great," has passed through several editions. He was installed archdeacon of Stowe and prebend of Lincoln in 1712. He died in 1730.

EADMERUS, an esteemed historian, was an Englishman; but his parents, and the particular time and place of his nativity, are not known. He received a learned education, and very early discovered a taste for history, by recording every remarkable event that came to his knowledge. Being a monk in the cathedral of Canterbury, he had the happiness to become the bosom-friend and inseparable companion of two archbishops of that see, St Anselm and his successor Ralph. To the former of these he was appointed spiritual director by the Pope; and that prelate would do nothing without his permission. In the year 1120, he was sent for by king Alexander I. of Scotland, to be raised to the primacy of that kingdom; and having obtained leave of king Henry and the archbishop of Canterbury, he departed for Scotland, where he was kindly received by the king; and on the third day after his arrival, he was elected bishop of St Andrew's with much unanimity. But on the day after his election, an unhappy dispute arose between the king and him, in a private conference about his consecration. Eadmerus having been a constant companion of the late and of the present archbishops of Canterbury, was a violent stickler for the prerogatives of that see. He therefore told the king, that he was determined to be consecrated by none but the archbishop of Canterbury, who he believed to be the primate of all Britain. Alexander, who was a fierce prince,

Eachard,
Eadmerus.

Eagle.

prince, and supported the independency of his crown and kingdom with great spirit, was so much offended, that he broke off the conference in a violent passion, declaring, that the see of Canterbury had no pre-eminency over that of St Andrew's. This breach between the king and the bishop-elect became daily wider, till at length Eadmerus, despairing of recovering the royal favour, sent his pastoral ring to the king, and laid his pastoral staff on the high altar, from whence he had taken it, and abandoning his bishopric returned to England. He was kindly received by the archbishop and clergy of Canterbury, though they disapproved of his stiffness, and thought him too haughty in forsaking the honourable station to which he had been called. Nor was it long before Eadmerus became sensible of his error, and desirous of correcting it. With this view he wrote a long submissive letter to the king of Scotland, intreating his leave to return to his bishopric, promising compliance with his royal pleasure in every thing respecting his consecration, which was accompanied by an epistle to the same purpose from the archbishop. These letters, however, which were written A. D. 1122, did not produce the desired effect. But Eadmerus is most worthy of the grateful remembrance of posterity for his historical works, particularly for his excellent history of the affairs of England in his own time, from A. D. 1066 to A. D. 1122; in which he hath inserted many original papers, and preserved many important facts, that are no where else to be found. This work hath been highly commended, both by ancient and modern writers, for its authenticity, as well as for regularity of composition and purity of style. It is indeed more free from legendary tales than any other work of this period; and it is impossible to peruse it with attention, without conceiving a favourable opinion of the learning, good sense, sincerity, and candour of its author.

EAGLE, in ornithology. See FALCO.

EAGLE, in heraldry, is accounted one of the most noble bearings in armoury; and, according to the learned in this science, ought to be given to none but such as greatly excel in the virtues of generosity and courage, or for having done singular services to their sovereigns; in which cases they may be allowed a whole eagle, or an eagle passant, or only the head or other parts thereof, as may be most agreeable to their exploits.

The eagle has been borne, by way of ensign or standard, by several nations. The first who seem to have assumed the eagle are the Persians; according to the testimony of Xenophon. Afterwards, it was taken by the Romans; who, after a great variety of standards, at length fixed on the eagle, in the second year of the consulate of C. Marius: till that time, they used indifferently wolves, leopards, and eagles, according to the humour of the commander.

The Roman eagles, it must be observed, were not painted on a cloth or flag; but were figures in relief, of silver or gold, borne on the tops of pikes; the wings being displayed, and frequently a thunder-bolt in their talons. Under the eagle on the pike, were piled bucklers, and sometimes crowns. Thus much we learn from the medals.

Constantine is said to have first introduced the eagle

with two heads, to intimate, that though the empire seemed divided, it was yet only one body. Others say, that it was Charlemagne who resumed the eagle as the Roman ensign, and added to it a second head; but that opinion is destroyed, by an eagle with two heads, noted by Lippius, on the Antonine column; as also by the eagle's only having one head on the seal of the golden bull of the emperor Charles IV. The conjecture, therefore, of F. Menestrier appears more probable, who maintains, that as the emperors of the east, when there were two on the throne at the same time, struck their coins with the impression of a cross, with a double traverse, which each of them held in one hand, as being the symbol of the Christians; the like they did with the eagle in their ensigns; and instead of doubling their eagles, they joined them together, and represented them with two heads. In which they were followed by the emperors of the West.

F. Papebroche wishes that this conjecture of Menestrier were confirmed by ancient coins; without which, he rather inclines to think the use of the eagle with two heads to be merely arbitrary; though he grants it probable, that it was first introduced on occasion of two emperors in the same throne.

The eagle on medals, according to M. Spanheim, is a symbol of divinity and providence; and, according to all other antiquities, of empire. The princes on whose medals it is most usually found, are the Ptolemies and the Seleucides of Syria. An eagle with the word CONSECratio, expresses the apotheosis of an emperor.

EAGLES, a name found very frequently in the ancient histories of Ireland, and used to express a sort of base money that was current in that kingdom in the first years of the reign of Edward I. that is, about the year 1272. There were, besides the eagles, lions, roses, and many other coins of the same sort, named according to the figures they were impressed with.

The current coin of the kingdom was at that time a composition of copper and silver, in a determined proportion, but these were so much worse than the standard proportion of that time, that they were not intrinsically worth quite half so much as the others. They were imported out of France and other foreign countries. When this prince had been a few years established on the throne, he set up mints in Ireland for the coining sufficient quantities of good money, and then denied the use of these eagles, and other the like kinds of base coins, and made it death, with confiscation of effects, to import any more of them into the kingdom.

EAGLE, in astronomy, is a constellation of the northern hemisphere, having its right wing contiguous to the equinoctial. See AQUILA.

There are three several stars, particularly denominated among the Arab astronomers, *nafr*, i. e. "eagle." The first, *nafr sobail*, the "eagle of canopus," called also *sitarah jemen*, the star of Arabia Felix, over which it is supposed to preside; the second, *nafr alhair*, the "flying eagle;" and the third, *nafr alwake*, the "resting eagle."

White EAGLE, is a Polish order of knighthood, instituted in 1325 by Uladislavus V. on marrying his son

F f 2

Casimir

Eagle

Eagle
||
Ear.

Cashmere with a daughter of the great-duke of Lithuania.

The knights of this order were distinguished by a gold chain, which they wore on the stomach, whereon hung a silver eagle crowned.

Black Eagle, was a like order, instituted in 1701 by the elector of Brandenburg, on his being crowned king of Prussia.

The knights of this order wear an orange-coloured ribbon, to which is suspended a black eagle.

Eagle, in architecture, is a figure of that bird anciently used as an attribute, or cognizance of Jupiter, in the capital and friezes of the columns of temples consecrated to that god.

Eagle-flower. See **BALSAMINE**.

Eagle-stone, in natural history, a stone, by the Greeks called *aiter*, and by the Italians *pietra d'aquila*, as being supposed to be sometimes found in the eagle's nest. It is of famous traditionary virtue, either for forwarding or preventing the delivery of women in labour, according as it is applied above or below the womb. Matthioli tells us, that birds of prey could never hatch their young without it, and that they go in search for it as far as the East Indies. Bauhin has an express Latin treatise on the subject. See **ÆTITES**.

EAGLET, a diminutive of eagle, properly signifying a young eagle. In heraldry, when there are several eagles on the same escutcheon, they are termed *eaglets*.

EALDERMAN, or **EALDORMAN**, among the Saxons, was of like import with earl among the Danes.

The word was also used for an elder, senator, or statesman. Hence, at this day, we call those *aldermen* who are associates to the chief officer in the common-council of a city or corporate town.

EAR, in anatomy. See there, n^o 141.

Several naturalists and physicians have held, that cutting off the ear rendered persons barren and unprolific; and this idle notion was what first occasioned the legislators to order the ears of thieves, &c. to be cut off, lest they should produce their like.

The ear has its beauties, which a good painter ought by no means to disregard; where it is well formed, it would be an injury to the head to be hidden. Suetonius insinuates, particularly, on the beauties of Augustus's ears; and Elian, describing the beauties of Aspasia, observes, she had short ears. Martial also ranks large ears among the number of deformities.

Among the Athenians, it was a mark of nobility to have the ears bored or perforated. And among the Hebrews and Romans, this was a mark of servitude.

Loss of one ear is a punishment enacted by 5 and 6 Edw. VI. cap. 4. for fighting in a church-yard; and by 2 and 3 Edw. VI. cap. 15. for combinations to raise the price of provisions, labour, &c. if it be the third offence, beside pillory, and perpetual infamy, or a fine of 40*l*.

By a statute of Henry VIII. maliciously cutting off the ear of a person is made a trespass, for which treble damages shall be recovered; and the offender is to pay a fine of ten pounds to the king.

37 Hen. VIII. cap. 6. § 4. In the index to the Statutes at Large, it is said, that this offence may be punished as felony, by 22 and 23 Car. II. cap. 1. § 7. commonly called *Coveatry's act*; but ear is not mentioned in that statute.

Ear of Fishes. See **COMPARATIVE ANATOMY**, n^o 167. **EAR**, in music, denotes a kind of internal sense, whereby we perceive and judge of harmony and musical sounds. See **MUSIC**.

In music we seem universally to acknowledge something like a distinct sense from the external one of hearing; and call it a *good ear*. And the like distinction we should probably acknowledge in other affairs, had we got distinct names to denote these powers of perception by. Thus a greater capacity of perceiving the beauties of painting, architecture, &c. is called a *fine taste*.

Ear is also used to signify a long cluster of flowers, or seeds, produced by certain plants; usually called by botanists *spica*. The flowers and seeds of wheat, rye, barley, &c. grow in ears. The same holds of the flowers of lavender, &c. We say the stem of the ear, i. e. its tube or straw; the knot of the ear; the lobes or cells wherein the grains are inclosed; the beard of the ear, &c.

EAR-ACH. See (the Index subjoined to) **MEDICINE**.

EAR-PICK, an instrument of ivory, silver, or other metal, somewhat in form of a probe, for cleaning the ear. The Chinese have a variety of these instruments, with which they are mighty fond of tickling their ears; but this practice, Sir Hans Sloane observes, must be very prejudicial to so delicate an organ, by bringing too great a flow of humours on it.

EAR-RING. See **PENDENT**.

EAR-WAX. See **CERUMEN**, and **ANATOMY**, p. 764, col. 1.

EARWIG, in zoology. See **FORFICULA**.

EARING, in the sea-language, is that part of the bolt-rope which at the four corners of the sail is left open, in the shape of a ring. The two uppermost parts are put over the ends of the yard-arms, and so the sail is made fast to the yard; and into the lowermost earings, the sheets and tacks are seized or bent at the clew.

EARL, a British title of nobility, next below a marquis, and above a viscount.

The title is so ancient, that its original cannot be clearly traced out. This much, however, seems tolerably certain, that among the Saxons they were called *ealdormen*, *quasi* elder men, signifying the same with *senior* or *senator* among the Romans; and also *schiremen*, because they had each of them the civil government of a several division or shire. On the irruption of the Danes they changed their names to *eorels*, which, according to Camden, signified the same in their language. In Latin they are called *comites* (a title first used in the empire), from being the king's attendants; *a sociate nomen sumperunt, regis enim tales sibi afficiant*. After the Norman conquest they were for some time called *counts*, or *countees*, from the French; but they did not long retain that name themselves, though their shires are from thence called *counties* to this day. It is now become a mere title: they have nothing to do with the government of the county; which is now en-

Ear
||
Earl.

Earl
||
Earth.

tirely devolved on the sheriff, the earl's deputy, or *viceroy*. In writs, commissions, and other formal instruments, the king, when he mentions any peer of the degree of an earl, usually styles him "truly and well-beloved cousin:" an appellation as ancient as the reign of Henry IV.; who being either by his wife, his mother, or his sisters, actually related or allied to every earl in the kingdom, artfully and constantly acknowledged that connection in all his letters and other public acts; whence the usage has descended to his successors, though the reason has long ago failed.

An earl is created by cincture of sword, mantle of state put upon him by the king himself, a cap and a coronet put upon his head, and a charter in his hand.

EARL-MARSHAL. See MARSHAL.

EARNST (ARRHÆ), money advanced to bind the parties to the performance of a verbal bargain. By the civil law, he who recedes from his bargain loses his earnest, and if the person who received the earnest give back, he is to return the earnest double. But with us, the person who gave it, is in strictness obliged to abide by his bargain; and in case he decline it, is not discharged upon forfeiting his earnest, but may be sued for the whole money stipulated.

EARTH, among ancient philosophers, one of the four elements of which the whole system of nature was thought to be composed. See ELEMENT.

EARTHS, in chemistry, are defined by Cronstedt to be such substances as are not ductile, mostly indissoluble in water or oil, and that preserve their constitution in a strong heat. Mr Bergman remarks that they are infusible, and not soluble in 1000 times their weight of boiling water; though, by augmenting the heat as in Papin's digester, perhaps all the kinds we are yet acquainted with may be found capable of solution, especially when precipitated from some other menstruum; their surface being then greatly augmented. In the chain of nature they proceed by an insensible gradation towards the salts, so that they cannot be separated but by artificial limits. A moderate heat does not change their form, nor are they dissipated by a more violent one. Dr Black defines them to be such bodies as are not soluble in water, not inflammable, and their specific gravity not more than four times the weight of water. They are distinguished from the salts by their insolubility; from the inflammables, by their want of inflammability; and from the metals, by their deficiency in weight. Some objections have been made to this definition, as not being strictly applicable to those earths which are known to be soluble in water: but this objection may be accounted of little weight, when we consider the extreme disparity betwixt the solubility of the earths and salts, a few grains of the earths saturating some pounds of water; so that if they have any solubility, they must be allowed to possess but a very small share of it.

Another property, which is not usually taken into the definition, makes nevertheless a remarkable part of the character of earthy bodies, viz. their great fixedness in the fire. All the other classes of bodies show themselves volatile in more or less violent degrees of heat. All the salts can be made to evaporate; all the inflammable substances are volatile; all the metals,

Earth.

gold not excepted, have been converted into vapour; but the earths, as far as we know, have never been volatilized, excepting only two, the diamond and asbestos. Some phenomena attending the volatilization of the diamond give reason to suspect that it is not a pure earthy substance. There is an appearance of inflammation; and it seems to be a compound, having an earthy matter for its basis, and deriving its volatility from other matters. In general therefore, the earths have been found fixed in any degree of heat of which we have had experience; though there is no doubt a possibility, that heat might be raised to such an intensity as to volatilize the most fixed body in nature; but till the means of doing so shall be found out, the earths may be considered as absolutely fixed.

The earths called *primitive* or *simple*, because they cannot be decomposed by any method hitherto known, were by Cronstedt supposed to be nine; but later chemists have reduced them to five. Some reduce the number still farther; but Mr Bergman informs us that these "rest their opinions upon fanciful metamorphoses unsupported by faithful experiments. As experiments teach us that there are five primitive earths, it is evident that the species arising from their mixture cannot exceed 24, viz. ten double, consisting of two earths; six triple, three quadruple, and the five primitive earths. Even all these different mixtures have not been found, though they probably do exist in nature. The natural compositions of acids with the earths, forming substances not soluble in 1000 times their weight of boiling water, and which may be called *saline earths*, are undoubtedly chemical combinations. The five primitive earths are, terra ponderosa; calx or calcareous earth, capable of being reduced into quicklime; magnesia; argilla or argillaceous earth; and siliceous earths.

"But though we must consider these as the most pure of all the earthy bodies, they are never found native in a state of absolute purity; nor indeed can they be made perfectly pure even by artificial means. Water and aerial acid unite readily with the four first; and when expelled by fire, a little of the matter of heat is added, until driven out by a more powerful attraction. But in this state they possess a degree of purity not to be attained by any other known method. Therefore it is necessary to examine them when sufficiently burnt, in order to distinguish better what properties depend upon adhering heterogeneous matters."

Our author at first added the earth of gems to the five classes already mentioned; but he found afterwards that all kinds of gems are compounded of some of the five kinds already mentioned, particularly of the argillaceous kind, inasmuch that they may be said almost entirely to belong to this class. Still, however, the earth of diamonds seems to possess properties essentially distinct from the five already mentioned, and therefore may not unjustly be reckoned a sixth class, though its characters have as yet been but very imperfectly examined.

1. *Terra Ponderosa*. This was discovered in Sweden about the year 1774, and is found in several different forms.

1. Combined with aerial acid, called by Dr Withering *terra ponderosa acrata*. This substance has been

met.

Earth.

met with in England; and an account of it, with Dr Withering's analysis, is given under the article CHEMISTRY.

2. The spar-like gypsum, marmor metallicum, lapis bononiensis, phosphorus nativus, baro-felenite, &c. is of very considerable specific gravity, approaching to that of tin or iron; on which account it has been supposed to contain something metallic. But no experiments hitherto made have evinced the existence of any metal in it, excepting a few traces of iron, which are to be met with in all the gypsa. It is met with of two kinds, semitransparent and opaque; the latter being either of a white or reddish colour. The specific gravity is about 4,500, water being accounted 1000. It contains about 84 parts of ponderous earth, 13 of the most concentrated vitriolic acid, and three of water. The method of preparing the phosphorus from this substance is mentioned under the article CHEMISTRY; but Cronstedt observes, that the phosphorescent quality of these stones is different from that of the sparry fluors and limestones, which is only produced by their being slowly heated, and seems to arise from a phlogiston which is destroyed by a glowing heat. M. Scheffer, in the Stockholm Memoirs for 1753, relates some experiments on a stone of this kind from China, which show that it is exactly the same with the *pelunse* of that country, an ingredient in their porcelain manufactories. This stone does not burn into plaster as gypsum does, and is infusible by itself. It frequently contains calcareous earth, and sometimes is met with in the ores of metals, and it likewise forms the basis of some petrifications. Sometimes it contains one or two parts of iron in the hundred.

3. The marmor metallicum drusicum, or ponderous drusen spar, is found in the lead-mines at Alstonmoor in Cumberland, regularly crystallized in the form of alum, solid, and semitransparent. M. Magellan says that he was showed some fine specimens of this mineral by a Mr Thomson, who informed him that "it seems to affect the peculiarity of having its crystals laminated, as radiating from a centre; but that this radiation seldom amounts to a whole circle. The corners of these flat crystals are truncated like those of alum, and thicker on one side than the other of the parallelogram, in such a manner as to fit one another in the kind of arch'd vault which they form together, and have some small ones adhering to their sides like drusen spars, having internal angles, as the *maeles* of the French, or the cruciform crystallizations." The specific gravity of these crystals were found by Mr Nicholson, with an instrument of his own invention, to be to water as 44745 to 10,000. This species of crystals is found in Auvergne in France; and has been described by Mr. Bayen, who supposed its basis to be calcareous. It was extremely refractory, and the surface of its crystals covered with ferruginous ochre. A variety of this is found jagged like cocks combs. This is met with in cliffs and fissures, accreted on the surfaces of balls of the same substance. In Derbyshire this substance is called *caulk* or *calc*. M. Magellan was showed some specimens of it by Mr Whitehurst, which had not only convex but flat surfaces. Those of the upper aggregated parts were rather like the edges

Earth.

of very thin flattish lenses put together, than like cocks combs. Varieties of it are also found of white and reddish colours. It is likewise met with of a fibrous texture in the form of zeolite or asbestos in filaments. M. Monnet is of opinion that these spars sometimes contain phlogiston, having observed that they become a liver of sulphur in a strong heat; but Mr Woulfe is of opinion that this gentleman was deceived by charcoal falling into his crucible.

4. The lapis hepaticus, or leberstein of the Germans and Swedes. Some specimens of this stone constantly smell like liver of sulphur, but others only when rubbed. It does not effervesce with acids, and according to M. Magellan is a medium between the gypsum and fetid calcareous stones with which it has generally been confounded; but it will not yield any lime, though the latter are more fit for the purpose than any other. Mr Kirwan informs us that this stone is generally compact, but not hard enough to strike fire; its texture is either equable or laminar, scaly or sparry; and it takes a polish like alabaster, does not effervesce with acids, and when calcined is partially reduced to a kind of plaster of Paris. According to the analysis of this stone given us by Professor Bergman, 100 parts of it contain 33 of baro-felenite, 38 of siliceous earth, 22 of alum, seven of gypsum, and five of mineral oil. Cronstedt denies that these stones contain any volatile alkali, though his assertion is contradicted by Wallerius, who affirms, that a volatile alkali certainly exists in them, and may be discovered by a chemical analysis. "The method which nature takes to combine the ingredients of the lapis hepaticus (says Cronstedt), may be perhaps the same as when a limestone is laid in a heap of munde while it is roasting; because there the sulphur unites itself with the limestone, whereby the latter acquires the smell of liver of sulphur, instead of which the vitriolic acid alone enters the composition of gypsum. How the sulphur combines itself may likewise be observed in the slate-balls or kernels from the Andrarum alum mines to be afterwards mentioned, where it sometimes combines with a martial earth with which this slate abounds, and with it forms pyrites within the very slate-balls. The fetid or swine stones, as well as the liver-stones, are, with regard to the structure of their parts, subject to the same varieties with the other kinds of limestones." This kind of stone is found, 1. Scaly, of which there are two varieties; one having coarse scales, the other of a whitish yellow colour. 2. With fine glittering scales. This is met with of a black colour at Andrarum in Sweden, in the alum slate above mentioned. Bergman says that this kind consists of a ponderous earth combined with vitriolic acid, mixed with a rock oil, and with the calcareous, argillaceous, and siliceous earths. He adds, that by a chemical analysis one of these kernels gave 29 parts of caustic ponderous earth, 33 of siliceous, almost 5 of the argillaceous, and 3.7 of lime, besides the water and vitriolic acid which entered its composition.

II. *Calcareous Earths*, when freed from impurities as far as possible, have the following properties. 1. They become friable when burnt in the fire. 2. They more readily fall into powder by being thrown into water, or having it thrown upon them after calcination. 3. They cannot be melted by themselves into glass in close

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close vessels. 4. They augment the causticity of alkaline salts by being mixed with them after burning. 5. They exhibit different phenomena in combination with the different acids. With the vitriolic they precipitate in the form of a gypseous earth capable of shooting, by proper management, into felenitic crystals. With marine acid they form a deliquescent mass called *fixed sal ammoniac*, and which forms a kind of phosphorus. With nitrous acid they combine into a glutinous deliquescent mass, from which the acid may be partly driven off by fire; in which operation part of the earth itself is volatilized, and which, in a certain state of calcination, produces Baldwin's phosphorus. With the fluor acid they regenerate the spar from which this acid was procured. With phosphoric acid they are said to regenerate the earth of bones; though the experiments by which this is said to be proved are, as we have often had occasion to observe, by no means conclusive. With the acid of vinegar they crystallize into neutral salts, which do not deliquesce in the air. 6. With borax they readily melt into a kind of glass which takes impressions in a degree of heat below ignition. 7. With the microcosmic acid they likewise melt into glass with effervescence; a circumstance likewise observable when borax is made use of; and both these glasses are quite colourless and transparent while hot, but become opaque as soon as they cool; but if the bead is thrown whilst hot into melted tallow, or even into warm water or any other hot liquor, it preserves its transparency. 8. With flus-spat they melt more readily than with any other into a kind of slag, by which crucibles are corroded. This, however, according to M. Magellan, is entirely to be attributed to the solvents. 9. In certain cases they are likewise found capable of reducing some metallic calces, as those of lead and bismuth; sometimes also those of iron and copper are affected, though in a less degree. But on this Mr Kirwan remarks, that such reductions take place only when the earth is combined with aerial acid; and that though calces of lead are in some measure reduced by chalk, they are not in the least affected by lime; which evidently proves that they receive phlogiston from fixed air, which is a compound of phlogiston and dephlogisticated air. 10. In this last instance, as well as in some others, they resemble alkaline salts; whence they frequently take the title of alkaline earths. Mr Bergman observes, that as calcareous earth united to the aerial acid is found native, very little trouble is necessary to procure it in a state of purity. For this purpose nothing more is requisite than to boil selected pieces of chalk repeatedly in pure water, which dissolves any calcined earth or *magnesia salina* that may be contained in it; after which operation it has no heterogeneous matter but what mechanically adheres to it, the quantity of which is generally extremely small; and if we likewise desire to have it absolutely free of this, we must dissolve it in vinegar, precipitate it with mild volatile alkali, and dry it after carefully washing the precipitate. The specific gravity of the precipitate thus carefully washed and dried is about 2.720. An hundred parts of it contain about 34 of aerial acid, 11 of water, and 54 of pure earth. Acids unite with it with effervescence, and the mixture produces heat. When burnt it loses $\frac{1}{10}$ of its weight;

and in this state dissolves in 700 times its weight of water, producing heat at the same time. If acids are poured upon it when in a calcined state, a great degree of heat is produced; inasmuch that unless part of it be abstracted by previously mixing the earth with water, the mixture will be made to boil. The pouring of water upon calcined earth of this kind likewise expels the atmospheric air from its pores. In this case, if nitrous or muriatic acid be added, no effervescence will ensue; the solution will proceed slowly, but the saturation becomes at length as perfect as if the earth had not been calcined. By this burnt earth the acid is expelled from sal ammoniac, sulphur is dissolved, and other remarkable effects performed, of which an account is given under the articles CHEMISTRY, DYEING, CEMENT, MORTAR, &c.

The calcareous earth, according to Cronstedt, is common to all the three kingdoms of nature; existing in the shells and bones of animals, the ashes of vegetables; and consequently, says he, it must have existed before any living or vegetable substance, and is no doubt distributed throughout the earth in a quantity proportioned to its general use.

The forms in which calcareous earth is ever met with are the shells of animals, chalk, limestone, and marble; for an account of which see these different articles. Its uses as a manure, and in building, are detailed under the articles CEMENT and AGRICULTURE. Messrs Sage, Rome de L'Isle, &c. have supposed the existence of a kind of earth called *absorbent*, distinct from the calcareous; but M. Monnet has shown this to be truly calcareous.

111. *Magnesia*, called also *terra muratica*, or *magnesia alba*. The nature and properties of this earth are described under the article MAGNESIA. It is found,

1. Combined with the vitriolic acid in the form of a bitter salt called Epsom or Sedlitz salt. This is found in great plenty in the liquor which remains after the crystallization of sea-salt.

2. With the marine acid; in which case it forms a salt likewise crystallizable, but of a very hot burning taste, and emitting vapours of spirit of salt by distillation. This is known by the name of *magnesia saluta*, and is likewise found in plenty in the liquor above mentioned.

3. It is contained also in fresh waters, where it is dissolved by the aerial acid.

4. Combined with the siliceous earth. This is commonly unctuous to the touch, and of different degrees of hardness, incapable of being diffused in water, and growing hard and very refractory in the fire. It is met with in various parts of the world, particularly in the east, and is the substance of which the large Turkey tobacco-pipes are made. It is also called *French chalk*, and is met with in England about the Land's End of Cornwall, of a yellow colour, or red and white like Castile soap. It consists, according to Mr Wiegleb, of equal parts of magnesia and siliceous earth. A mixture of this with calcareous earth and iron is found near Thionville in the French part of Luxembourg. It is of a blue colour, and contains the greatest proportion of calcareous earth, with some clay and petrified matters. Another of an olive colour is found in the same place; but has no argillaceous earth in it, though they both

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both look like clay, and the last is used in pottery. A mixture of this earth with clay, talc, and iron, is found in Silesia. It is of a greenish yellow, is of a loose form and greasy feel. According to Mr Margraff it contains one-third of magnesia.

5. In steatites or soap-rock. See *STEATITES*.

6. In serpentine stone. See *SERPENTINE*.

IV. *Argillaceous Earths*. See *CLAY*.

V. *Siliceous Earths*. See *CHEMISTRY*, *FLINT*, *GEMS*, *DIAMOND*, *EMERALD*, *SAPPHIRE*, &c. also *CHEMISTRY*, n° 829, 847, 1074, and 1076.

EARTH, in astronomy and geography, one of the primary planets; being this terraqueous globe which we inhabit.

The cosmogony, or knowledge of the original formation of the earth, the materials of which it was composed, and by what means they were disposed in the order in which we see them at present, is a subject which, though perhaps above the reach of human sagacity, has exercised the wit of philosophers in all ages. To recount the opinions of all the eminent philosophers of antiquity upon this subject would be very tedious: it may therefore suffice to observe, that, ever since the subject began to be canvassed, the opinions of those who have treated it may be divided into two classes. 1. Those who believed the earth and whole visible system of nature to be the Deity himself, or connected with him in the same manner that a human body is with its soul. 2. Those who believed the materials of it to have been eternal, but distinct from the Deity, and put into the present order by some power either inherent in themselves or belonging to the Deity. Of the former opinion was Zeno of Citium the founder of the *eleatic sect*, Strato of Lampiscus, the Peripatetics, &c.

The second opinion, namely, that the substance of the earth or universe (for it is impossible to speak of the one without the other) was eternal, though not the form, was most generally held among the ancients. From that established axiom, that "nothing can be produced from nothing," they concluded that creation was an impossibility; but at the same time they thought they had good reason to believe the world had not been always in its present form. They who held this opinion may again be divided into two classes: first, those who endeavoured to account for the generation of the world, or its reduction into the present form, by principles merely mechanical, without having recourse to any assistance from divine power; and, secondly, those who introduced an intelligent mind as the author and disposer of all things. To the first of these classes belonged the cosmogony of the Babylonians, Phœnicians, and Egyptians; the particulars of which are too absurd to deserve notice. Of the same opinion also were most of the poets; the philosophers Thales, Anaximander, Anaximenes, Anaxagoras, &c. The latter attempted to reform the philosophy of his master Anaximenes by introducing an intelligent principle into the world distinct from matter; thus making his intelligent principle, or God, the soul of the world. Diogenes of Apollonia supposed air, which he made the first principle of all things, to be endued with reason: His manner of philosophizing differed very little from that of Des Cartes. "All things (says he) being in

N° 106.

motion, some became condensed and others rarefied. In those places where condensation prevailed, a whirling motion or vortex was formed; which by its revolution drew in the rest, and the lighter parts flying upwards formed the sun."

The most remarkable of the atheistic systems, however, was the atomic one, supposed to have been invented by Democritus; though Laërtius attributes it to Leucippus, and some make it much older. According to this system, the first principles of all things were an infinite multitude of atoms, or indivisible particles of different sizes and figures; which, moving fortuitously, or without design, from all eternity, in infinite space, and encountering with one another, became variously entangled during their conflict. This first produced a confused chaos of all kinds of particles; which afterwards, by continual agitation, striking and repelling each other, disposed themselves into a vortex or vortices, where, after innumerable revolutions and motions in all possible directions, they at last settled into their present order.

The hypothesis of Democritus agrees in the main with that of Epicurus as represented by Lucretius; excepting that no mention is made of those vortices, which yet were an essential part of the former. To the two properties of magnitude and figure which Democritus attributed to his atoms, Epicurus added a third, namely, weight; and, without this, he did not imagine they could move at all. The system of Democritus necessarily introduced absolute fatal necessity; which Epicurus not choosing to agree to, he invented a third motion of the atoms, unknown to those who had gone before him. His predecessors allowed them to have a perpendicular and reflexive motion: but, Epicurus, though he allowed these motions to be absolutely necessary and unavoidable, asserted that the atoms could also of themselves decline from the right line: and from this declination of the atoms he explained the free will of man.—The most material difference between the two systems, however, was, that Epicurus admitted no principle but the atoms themselves; whereas Democritus believed them to be animated.

Of those who held two distinct and coeternal principles, *viz.* God and Matter, we shall only take notice of the opinions of Pythagoras, Plato, and Aristotle, as being the most remarkable.

Pythagoras is said to have asserted two substantial self-existent principles: a *monad*, or unity; and a *dyad*, or duality. The meaning of these terms is now somewhat uncertain. Some think, that by the monad he meant the Deity, and by the dyad matter. Others think, that the Pythagorean monads were atoms. The dyad is sometimes thought to signify a demon or evil principle; but Porphyry's interpretation, which seems the most probable, is as follows. The cause, says he, of that sympathy, harmony, and agreement which is in things, and of the conservation of the whole, which is always the same and like itself, was by Pythagoras called *unity*; that unity which is in the things themselves being but a participation of the first cause: but the reason of difference, inequality, and constant irregularity in things, was by him called a *dyad*. This philosopher held numbers to be the principles

Earth.

2
Systems of
Democritus
and Epicurus.

3
Of Pythagoras, Plato, and Aristotle.

1
Different
opinions
respecting
the cosmogony.

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ciples of all things; and from them he accounted for the production of the world in the following manner. He supposed that the monad and dyad were the two sources of numbers, from whence proceeded points; from points, lines; from lines, plane figures; from planes, solids: from solids, sensible bodies. The elements of sensible bodies are four; but, besides these, there was a fifth (never yet discovered). The four elements which manifest themselves to our senses are, fire, air, earth, and water. These are in a perpetual change, and from them the world was formed; which is animated, intelligent, and spherical; containing, in the midst of it, the earth, a globe and inhabited body. The world, he said, began from fire and the fifth element; and that as there were five figures of solid bodies, called mathematical or regular, the earth was made of the cube, fire of the pyramid or tetrahedron, the air of the octahedron, water of the icosaedron, and the sphere of the universe of the dodecahedron.—This method of philosophizing, which has no manner of foundation in nature, was adopted by Plato and Aristotle; and hence proceeded all the absurdities concerning ideas, forms, qualities, &c. with which the Aristotelian philosophy was loaded.

For a long time, however, the philosophy of Aristotle prevailed, and the world was thought to be upheld by forms, qualities, and other unintelligible and imaginary beings.—At last the French philosopher Des Cartes superseded the Aristotelian, by introducing the atomic or Democritic, and Epicurean philosophy *. The Cartesian system was quickly superseded by the Newtonian; which still continues, though considerably different from what it was left by that great man.—His opinions, indeed, concerning the cosmogony seem to have been in a fluctuating state; and hence he delivers himself in such a manner, that he hath often incurred the charge of contradicting himself.—He maintained, for instance, that matter was infinitely divisible; and the mathematical demonstrations of this proposition are well known. Notwithstanding this, however, when he comes particularly to speak of the original construction of the world, he seems to retract this opinion, and adopt the atomic philosophy. He tells us, that it seems probable, that in the beginning God formed matter in *solid, massy, impenetrable particles*, &c. †; and that of these particles, endowed with various powers of attraction and repulsion, the present system of nature is formed. His primary laws of nature are only three in number, and very simple. The first is, that all matter has a tendency to continue in that state in which it is once placed, whether of rest or motion. If it is at rest, for example, it will continue at rest for ever, without beginning motion of itself; but if it is once set in motion by any cause whatever, it will for ever continue to move in a right line, until something either stops it altogether, or forces it to move in another direction. 2. That the change of motion is always equivalent to the moving force employed to produce it, and in the direction of the right line in which it is impressed; that is, if a certain force produces a certain motion, double that force will produce double that motion, &c. 3. Reaction is always contrary and equal to action; or the actions of two bodies upon one another are always equal and contrary to one another.

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From these three laws, together with the two contrary forces of attraction and repulsion, Sir Isaac Newton and his followers have attempted to explain all the phenomena of nature. When they come to explain the nature of the attractive and repulsive forces, however, they are exceedingly embarrassed. Sir Isaac hath expressed himself in two different ways concerning them. In his Principia, he pretty positively determines them to be owing to a cause that is not material; and in his Queries, he supposes they may be effects of some subtle matter which he calls *ether*. This disagreement with himself hath produced no small disagreement among his followers. One party, laying hold of his assertions in the Principia, determine the world to be upheld by *immaterial* powers; while the other, neglecting the Principia, and taking notice only of the Queries at the end of the Optics, strenuously maintain, that attraction and repulsion are owing to the action of some exceedingly fine and subtle ether.—The first of these suppositions, it is argued, necessarily involves us in one of the following dilemmas. 1. If the attractive and repulsive forces are not material, they must either be occasioned by spiritual beings, or they must be *qualities* of matter. If they are occasioned by the action of immaterial beings, these beings must either be created or uncreated. If they are produced by the action of created beings, we run into the supposition of some of the ancient heathens, that the world is governed by demons or subordinate intelligences; and thus may make an easy transition to polytheism. If attraction and repulsion are the immediate action of the Deity himself, we run into the doctrine of making God the soul of the world.—This last hypothesis hath been most strenuously adopted by Mr Baxter in his treatise of the Immateriality of the human Soul. Mr Bosovich, Mr Mitchel, and Dr Priestley, have likewise adopted the hypothesis of immaterial powers to such a degree, that, according to them, the whole world consists of nothing else but *attractions and repulsions* surrounding *physical points* †. 2. If we suppose the attractive and repulsive powers to be only *properties, qualities, or laws*, *from*, n° 8. impressed on matter by the Deity, we might as well have been contented with the occult qualities of Aristotle.—If attraction and repulsion are occasioned by the action of mere matter, and all the powers in nature are only material, the charge is incurred of making nature direct itself in such a manner, that there is no occasion for the interposition, or even the existence, of a Deity at all.

Thus we see, the Newtonian cosmogony must incline either to the Platonic and Aristotelian, or to the Atomic or Epicurean; according to the hypothesis we lay down concerning the nature of attraction. Des Cartes's system was plainly a revival of that of Democritus and Epicurus, with some corrections and improvements. It was farther improved and corrected by Mr Hutchinson, who added to it the authority of Revelation. The created agents he chose in his cosmogony were fire, light, and air. These, we see, have indeed a very considerable share in the operations of nature; but unless we explain the manner in which they operate, our knowledge is not at all increased, and we might as well have been contented with the Newtonian attraction and repulsion, or even the occult qualities of Aristotle.—Attempts have indeed been made to solve the

6
Disagree-
ment a-
mong his
followers.

7
Mr Mit-
chel, Bos-
ovich, and
Dr Priest-
ley's opi-
nions.
† See Gebe-
r's n° 8.

8
Mr Hut-
chinson's
system.

* See *Astro-
nomy*,
n° 252.

4
Newtonian
system su-
percedes the
Aristote-
lian and
Cartesian.

† See *Cosmo-
logy*, n° 2.

5
Three laws
of nature
laid down
by Sir Isaac

Earth.

phenomena of nature, from the action of these three agents, both by Hutchinson himself and many of his followers.—These attempts, however, have always proved unsuccessful. Some phenomena indeed may be explained pretty plausibly from the known action of these three; but when we come to speak of what may be called the *nicer operations* of nature, such as the growth of plants and animals, we are utterly at a loss.

A deficiency of active principles in all the theories yet invented.

The manifest deficiency of active principles in all the theories of the earth that have yet been invented, hath occasioned a constant search after others which should be able, by their superior activity, to fill up the blank which necessarily remained in the system.—Pythagoras, Plato, and Aristotle, being unable to account for the formation of the earth from their four elements, called in the assistance of a *fifth*, which was never yet discovered. Epicurus, finding the motions attributed to his atoms by Democritus to be insufficient, had recourse to an imaginary, and on his own principles *impossible*, declination of the atoms. Des Cartes, finding the atoms themselves insufficient, asserted that they were not atoms, but might be broken into smaller parts, and thus constitute matter of various degrees of subtilty. The Newtonian philosophers have found Des Cartes's system insufficient; but being greatly distressed in their attempts to solve all the phenomena of nature by mere attraction and repulsion, have been obliged to call in the action of *mind* to their assistance. The Hutchinsonians were hardly put to it in accounting for every thing by the action of fire, light, and air, when luckily the discoveries in electricity came to their assistance. It must be owned, that this fluid does indeed come in like a kind of fifth element, which in many cases appears to be the animating principle of nature. For some time past, almost all the remarkable phenomena in nature have been explained by electricity, or the action of the electric fluid. But unless this action is explained, we are got no farther than we were before. To say that any thing is done by electricity, is not more intelligible than to say that it was done by attraction. If we explain an effect by a material cause, it ought to be done upon mechanical principles. We ought to be sensible how one part of matter acts upon another part in such a manner as to produce the effect we desire to explain. The electrical philosophers, however, have not yet been able to investigate the manner in which this subtle fluid operates; and hence the many discoveries in electricity have not contributed to throw that light on the theory of the earth, which perhaps they may do hereafter. With some philosophers, however, the electric fluid itself, and indeed all the powers of nature, were in danger of being superseded by a principle, lately very little known, called the *phlogiston*.—Thus, Mr Henly tells us*, that Mr Clarke, an ingenious gentleman in Ireland, hath discovered all the different kinds of air produced from metals, &c. by Dr Priestley, to be only *phlogistic vapours* arising from these substances. Dr Priestley himself supposes, that the electric light is a modification of *phlogiston*; and consequently thinks it probable, that all light is a modification of the same. Fire or flame is thought to be a chemical combination of air with the phlogiston; and phlogiston is thought to give the elasticity to air, and every other elastic fluid, &c. Another party, seem-

ingly jealous of the powers of this new principle, have denied its existence altogether, and in its stead introduced another equally insufficient, called the *oxygenous principle*. Others have reduced all nature to the two principles called *principium forbile* and *principium proprium*. All these, however, are shown, in other parts of this work, to be mere inactive substances; the phlogiston, common charcoal; the oxygenous principle, water deprived of the quantity of phlogiston it usually contains; the principium forbile, the flame; and the principium proprium, a name for the particular modification of the atoms, or what we please to call the invisible essence of matter which distinguishes one body from another, and which must be for ever unknown to all human creatures.—Be this as it will, the late discoveries in electricity have tended very much to change the form of the Newtonian philosophy, and to introduce that *materialism* into our theories of the natural phenomena which is by some people so much complained of.

From this general history of the different agents which philosophers have chosen to account for the original formation of the earth, and for its preservation in the present form, it appears, that scarce any advance in true knowledge hath yet been made. All the agents have been prodigiously defective; electricity itself, as far as yet known, not excepted. But before we enter into a particular consideration of those theories which seem most worthy of notice, it will be necessary to point out the principal difficulties which stand in the way of one who attempts to give a complete theory of the earth.

Little progress as yet made in true philosophy.

Difficulties which occur in forming a theory of the earth.

1. The earth, although pretty much of a spherical figure, is not completely so; but protuberates considerably about the equatorial parts, and is proportionably flattened at the poles, as is undeniably proved by the observations of modern mathematicians†. The question here is, Why the natural cause which gave the earth so much of a spherical figure, did not make it a complete and exact sphere?

2. The terraqueous globe consists of a vast quantity of water as well as dry land. In many places, such as the Isthmus of Darien, a narrow neck of land is interposed betwixt two vast oceans. These beat upon it on either side with vast force; yet the Isthmus is never broken down nor diminished. The cause is the same with the Isthmus of Suez which joins Asia and Africa, and with that which joins the Morea or ancient Peloponnesus to the continent. The difficulty is, By what natural power or law are these narrow necks of land preserved amidst the waters which threaten them on both sides with destruction?

3. The surface of the earth is by no means smooth and equal; but in some places raised into enormous ridges of mountains, and in others sunk down in such a manner as to form deep valleys. These mountains, though they have been exposed to all the injuries of the weather for many thousand years, exhibit no signs of decay. They still continue of the same size as before, though vast quantities of earth are frequently washed down from them by the rains, which, together with the force of gravity, tending to level and bring them on an equality with the plains on which they stand, we might reasonably think, ought by this time to have rendered them smaller than before. It must therefore

* Phil. Transf. Vol. 67.

† See Geography.

Earth.

therefore be inquired into, By what natural cause the mountains were originally formed, and how they come to preserve their size without any remarkable diminution?

4. The internal parts of the earth are still more wonderful than the external. The utmost industry of man, indeed, can penetrate but a little way into it. As far as we can reach, however, it is found to be composed of dissimilar strata lying one upon another, not commonly in a horizontal direction, but inclined to the horizon at different angles. These strata seem not to be disposed either according to the laws of gravity or according to their density, but as it were by chance. Besides, in the internal parts of the earth are vast chasms and vacuities. By what means were these strata originally deposited, the fissures and chasms made, &c.?

5. In many places of the earth, both on the surface and at great depths under it, vast quantities of marina productions, such as shells, &c. are to be met with. Sometimes these shells are found in the midst of solid rocks of marble and limestone. In the very heart of the hardest stones, also, small vegetable substances, as leaves, &c. are sometimes to be found. The question is, By what means were they brought thither?

These are some of the most striking difficulties which present themselves to one who undertakes to write a natural history or theory of the earth. The most remarkable attempts to produce a theory of this kind are the following.

11
Dr Burnet's
theory.

I. According to Dr Burnet, the earth was originally a fluid mass, or chaos, composed of various substances differing both in density and figure. Those which were most heavy, sunk to the centre, and formed there a hard solid body: those which were specifically lighter remained next above; and the waters, which were lightest of all, covered the earth all round. The air, and other ethereal fluids, which are still lighter than water, floated above it, and surrounded the globe also. Between the waters, however, and the circumambient air, was formed a coat of oily and unctuous matter lighter than water. The air at first was very impure, and must necessarily have carried up with it many of those earthy particles with which it was once blended: however, it soon began to purify itself, and deposited those particles upon the oily crust above mentioned; which, soon uniting together, the earth and oil became the crust of vegetable earth, with which the whole globe is now covered. His account of the destruction of the primeval world by the flood, by the falling down of the shell of earth into the waters of the abyss, is given under the article *DELUGES*. It only remains then to give his account of the manner in which he relieves the earth from this universal destruction; and this he does as follows. These great masses of earth, says he, falling into the abyss, drew down with them vast quantities also of air; and by dashing against each other, and breaking into small parts by the repeated violence of the shock, they at length left between them large cavities filled with nothing but air. These cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became once more visible. The higher parts of its broken surface, now become the tops of mountains, were the first that appeared; the plains soon after came forward; and at length the whole globe was

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delivered from the waters, except the places in the lowest situations; so that the ocean and seas are still a part of the ancient abyss, that have had no place to which they might return. Islands and rocks are fragments of the earth's former crust; continents are larger masses of its broken substance; and all the inequalities that are to be found on the surface of the present earth are effects of the confusion into which both earth and water were at that time thrown.

II. Dr Woodward begins with asserting, that all terrene substances are disposed in beds of various natures, lying horizontally one over the other, somewhat like the coats of an onion: that they are replete with shells, and other productions of the sea; these shells being found in the deepest cavities, and on the tops of the highest mountains. From these observations, which are warranted by experience, he proceeds to observe, that these shells and extraneous fossils are not productions of the earth, but are all actual remains of those animals which they are known to resemble; that all the strata or beds of the earth lie under each other in the order of their specific gravity, and that they are disposed as if they had been left there by subsiding waters. All this he very confidently affirms, tho' daily experience contradicts him in some of them; particularly, we often find layers of stone over the lightest soils, and the softest earth under the hardest bodies. However, having taken it for granted, that all the layers of the earth are found in the order of their specific gravity, the lightest at top, and the heaviest next the centre, he consequently asserts, that all the substances of which the earth is composed were originally in a state of dissolution. This dissolution he supposes to have taken place at the flood: but being aware of an objection, that the shells, &c. supposed to have been deposited at the flood are not dissolved, he exempts them from the solvent power of the waters, and endeavours to show that they have a stronger cohesion than minerals; and that, while even the hardest rocks are dissolved, bones and shells may remain entire.

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Dr Woodward's.

III. Mr Whiston supposes the earth to have been originally a comet; and considers the Mosaic account of the creation as commencing at the time when the Creator placed this comet in a more regular manner, and made it a planet in the solar system. Before that time, he supposes it to have been a globe without beauty or proportion; a world in disorder, subject to all the vicissitudes which comets endure; which, according to the present system of philosophy, must be alternately exposed to the extremes of heat and cold. These alternations of heat and cold, continually melting and freezing the surface of the earth, he supposes to have produced, to a certain depth, a chaos resembling that described by the poets, surrounding the solid contents of the earth, which still continued unchanged in the midst; making a great burning globe of more than 2000 leagues in diameter. This surrounding chaos, however, was far from being solid: it resembles it to a dense, though fluid atmosphere, composed of substances mingled, agitated, and shocked against each other; and in this disorder he supposes the earth to have been just at the eve of the Mosaic creation. But upon its orbit being then changed, when it was more regularly wheeled round the sun, every thing took its proper place, every part of the surrounding fluid then

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fell into a certain situation according as it was light or heavy. The middle or central part, which always remained unchanged, still continued so; retaining a part of that heat which it received in its primeval approaches towards the sun; which heat he calculates may continue about 6000 years. Next to this fell the heavier parts of the chaotic atmosphere, which serve to sustain the lighter: but as in descending they could not entirely be separated from many watery parts, with which they were intimately mixed, they drew down these also along with them; and these could not mount again after the surface of the earth was consolidated: they therefore surrounded the heavy first-descending parts in the same manner as these surrounded the central globe. Thus the entire body of the earth is composed next the centre of a great burning globe: next this is placed an heavy terrene substance that encompasses it; round which is circumsufed a body of water. Upon this body of water is placed the crust of earth on which we inhabit: so that, according to Mr Whiston, the globe is composed of a number of coats or shells, one within the other, all of different densities. The body of the earth being thus formed, the air, which is the lightest substance of all, surrounded its surface; and the beams of the sun darting through, produced the light, which, we are told by Moses, first obeyed the divine command.

The whole economy of the creation being thus adjusted, it only remained to account for the risings and depressions on the surface of the earth, with the other seeming irregularities of its present appearance. The hills and valleys are by him considered as formed by their pressing upon the internal fluid which sustains the external shell of earth, with greater or less weight: those parts of the earth which are heaviest sink the lowest into the subjacent fluid, and thus become valleys: those that are lightest rise higher upon the earth's surface, and are called *mountains*.

Such was the face of nature before the deluge: the earth was then more fertile and populous than it is at present; the life of men and animals was extended to ten times its present duration; and all these advantages arose from the superior heat of the central globe, which has ever since been cooling. As its heat was then in its full power, the genial principle was also much greater than at present; vegetation and animal increase were carried on with more vigour; and all nature seemed teeming with the seeds of life. But as these advantages were productive only of moral evil, it was found necessary to destroy all living creatures by a flood; and in what manner this punishment was accomplished, according to Mr Whiston, is particularly taken notice of under the article *DELUGE*.

IV. M. Buffon's theory differs very widely from the foregoing. He begins with attempting to prove, that this world which we inhabit is no more than the ruins of a world. "The surface of this immense globe (says he) exhibits to our observation, heights, depths, plains, seas, marshes, rivers, caverns, gulfs, volcanoes; and on a cursory view, we can discover in the disposition of these objects neither order nor regularity. If we penetrate into the bowels of the earth, we find metals, minerals, stones, bitumens, sands, earths, waters, and matter of every kind, placed as it were by mere accident, and without any apparent design. Upon a

nearer and more attentive inspection, we discover sunk mountains, caverns filled up, shattered rocks, whole countries swallowed up, new islands emerged from the ocean, heavy substances placed above light ones, hard bodies inclosed within soft bodies: in a word, we find matter in every form, dry and humid, warm and cold, solid and brittle, blended in a chaos of confusion, which can be compared to nothing but a heap of rubbish, or the ruins of a world."

When taking a particular survey of the external surface of the globe, he begins with the ocean, and the motion communicated to it by the influence of the sun and moon which produces the tides.—"In examining the bottom of the sea (says he), we perceive it to be equally irregular as the surface of the dry land. We discover hills and valleys, plains and hollows, rocks and earths of every kind; we discover likewise, that islands are nothing but the summits of vast mountains, whose foundations are buried in the ocean. We find other mountains whose tops are nearly on a level with the surface of the water; and rapid currents which run contrary to the general movement. These currents sometimes run in the same direction; at other times their motion is retrograde; but they never exceed their natural limits, which seem to be as immutable as those which bound the efforts of land-rivers. On one hand we meet with tempestuous regions, where the winds blow with irresistible fury; where the heavens and the ocean, equally convulsed, are mixed and confounded in the general shock; violent intestine motions, tumultuous swellings, water-spouts, and strange agitations produced by volcanoes, whose mouths, thro' many fathoms below the surface, vomit forth torrents of fire; and push, even to the clouds, a thick vapour, composed of water, sulphur, and bitumen; and dreadful gulphs or whirlpools, which seem to attract vessels for no other purpose than to swallow them up. On the other hand we discover vast regions of an opposite nature, always smooth and calm, but equally dangerous to the mariner. To conclude, directing our eyes toward the southern or northern extremities of the globe, we discover huge masses of ice, which, detaching themselves from the polar regions, advance, like floating mountains, to the temperate climates, where they dissolve and vanish from our view. The bottom of the ocean and the shelving sides of rocks produce plentiful crops of plants of many different species: its soil is composed of sand, gravel, rocks, and shells; in some places it is a fine clay, in others a compact earth: and in general, the bottom of the sea has an exact resemblance to the dry land which we inhabit.

"Let us next take a view of the dry land. Upon an attentive observation of this, we will find, that the great chains of mountains lie nearer the equator than the poles; that in the old continent their direction is more from east to west than from south to north; and that, on the contrary, in the new continent they extend more from north to south than from east to west. But what is still more remarkable, the figure and direction of these mountains, which have a most irregular appearance, correspond so wonderfully, that the prominent angles of one mountain are constantly opposite to the concave angles of the neighbouring mountain, and of equal dimensions, whether they be separated by an extensive plain or a small valley. I have further

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further remarked, that opposite hills are always nearly of the same height; and that mountains generally occupy the middle of continents, islands, and promontories, dividing them by their greatest lengths. I have likewise traced the courses of the principal rivers, and find that their direction is nearly perpendicular to the sea-coasts into which they empty themselves; and that during the greatest part of their courses they follow the direction of the mountains from which they derive their origin. The sea-coasts are generally bordered with rocks of marble and other hard stones; or rather with earth and sand accumulated by the waters of the sea, or brought down and deposited by rivers. In opposite coasts, separated only by small arms of the sea, the different strata or beds of earth are of the same materials. I find that volcanoes never exist but in very high mountains; that a great number of them are entirely extinguished; that some are connected to others by subterranean passages, and their eruptions not unfrequently happen at the same time. There are similar communications between certain lakes and seas. Some rivers suddenly disappear, and seem to precipitate themselves into the bowels of the earth. We likewise find certain mediterranean or inland seas, that constantly receive from many and great rivers prodigious quantities of water, without any augmentation of their bounds; probably discharging by subterranean passages all those extraneous supplies. It is likewise easy to distinguish lands which have been long inhabited, from those new countries where the earth appears in a rude state, where the rivers are full of cataracts, where the land is nearly overflowed with water or burnt up with drought, and where every place capable of producing trees is totally covered with wood.

“Proceeding in our examination, we discover that the upper stratum of the earth is universally the same substance: that this substance, from which all animals and vegetables derive their growth and nourishment, is nothing but a composition of the decayed parts of animal and vegetable bodies, reduced into such small particles that their former organic state is not distinguishable. Penetrating a little deeper, we find the real earth, beds of sand, limestone, clay, shells, marble, gravel, chalk, &c. These beds are always parallel to each other, and of the same thickness throughout their whole extent. In neighbouring hills, beds or strata of the same materials are uniformly found at the same levels, though the hills be separated by large and deep valleys. Strata of every kind, even of the most solid rocks, are uniformly divided by perpendicular fissures. Shells, skeletons of fishes, marine plants, &c. are often found in the bowels of the earth, and on the tops of mountains, even at the greatest distances from the sea. These shells, fishes, and plants, are exactly similar to those which exist in the ocean. Petrified shells are to be met with almost every where in prodigious quantities: they are not only inclosed in rocks of marble and limestone, as well as in earths and clays, but are actually incorporated and filled with the very substances in which they are inclosed. In fine, I am convinced, from repeated observation, that marbles, limestones, chalks, marls, clays, sand, and almost all terrestrial substances, wherever situated, are full of shells and other spoils of the ocean.”

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From these positions, which he lays down as facts, Mr Buffon draws the following conclusions:

1. The changes which the earth has undergone within these last 2000 or 3000 years must be inconsiderable, when compared with the great revolutions that took place in those ages immediately succeeding the creation. The reason he gives for this assertion is, that terrestrial substances could not acquire solidity but by the continued action of gravity: hence the earth must have been originally much softer than it is now, and therefore more apt to be changed by causes which cannot now affect it.

2. It seems an incontrovertible fact, that the dry land which we now inhabit, and even the summits of the highest mountains, were formerly covered with the waters of the sea; for shells and other marine bodies are still found upon the very tops of mountains.

3. The waters of the sea have remained for a long track of time upon the surface; because in many places, such immense banks of shells have been discovered, that it is impossible so great a multitude of animals could exist at the same time.

4. From this circumstance it likewise appears, that although the materials on the surface of the earth were then soft, easily disunited, moved, and transported by the waters, yet these transportations could not be suddenly effected: they must have been gradual and successive, as sea-bodies are sometimes found more than 1000 feet below the surface; and such a thickness of earth or stone could not be accumulated in a short time.

5. It is impossible these effects could be owing to the universal deluge. For though we should suppose that all the shells in the bottom of the ocean should be deposited upon the dry land; yet, besides the difficulty of establishing this supposition, it is plain, that as shells are found incorporated in marble, and in the rocks of the highest mountains, we must suppose these rocks and marbles to have been formed all at the very instant when the deluge took place; and that before this grand revolution, there were neither mountains, nor marbles, nor rocks, nor clays, nor matter of any kind similar to what we are now acquainted with; as they all, with few exceptions, contain shells and other productions of the ocean. Besides, at the time of the universal deluge, the earth must have acquired a considerable degree of solidity, by the action of gravity for more than 16 centuries. During the short time the deluge lasted, therefore, it is impossible that the waters should have overturned and dissolved the whole surface of the earth to the greatest depths.

6. It is certain (for what reason he does not mention), that the waters of the sea have, at some period or other, remained for a succession of ages upon what we now know to be dry land; and consequently that the vast continents of Asia, Europe, Africa, and America, were then the bottom of an immense ocean, replete with every thing which the present ocean produces.

7. It is likewise certain, that the different strata of the earth are horizontal and parallel to each other. This parallel situation must therefore be owing to the operation of the waters, which have gradually accumulated the different materials, and given them the same position which the water itself invariably assumes.

8. It is certain that these strata must have been gradually

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dually formed, and are not the effect of any sudden revolution; because nothing is more frequent than strata composed of heavy materials placed above light ones; which never could have happened if, according to some authors, the whole had been blended and dissolved by the deluge, and afterwards precipitated.

9. No other cause than the motion and sediments of water could possibly produce the regular position of the various strata of which the superficial part of this earth consists. The highest mountains are composed of parallel strata, as well as the lowest valleys. Of course, the formation of mountains cannot be attributed to the shock of earthquakes, or to the eruptions of volcanoes. Such small eminences as have been raised by volcanoes or convulsions of the earth, instead of being composed of parallel strata, are mere masses of weighty materials, blended together in the utmost confusion.

Having now, as he thinks, *proved*, that the dry and habitable part of the earth has remained for a long time under the waters of the sea, and consequently must have undergone the same changes that now take place at the bottom of the sea, he proceeds to inquire what these changes are.

10. The ocean, since the creation of the world, has been constantly agitated by the tides, occasioned by the action of the sun and moon; and this agitation is greater in the equatorial than in the other parts of the globe, because the action of the sun and moon is there strongest.

11. The earth performs a rapid motion on its axis; and consequently its parts have a centrifugal force, which is also greatest at the equator.

12. From the combined action of the two last mentioned causes, the tides and the motion of the earth, it may be fairly concluded, that although this globe had been originally a perfect sphere, its diurnal motion, and the ebbing and flowing of the tides, must necessarily, in a succession of time, have elevated the equatorial parts, by gradually carrying mud, earth, sand, shells, &c. from other climates, and depositing them at the equator.

13. On this supposition, the greatest inequalities on the surface of the earth ought to be found, and in fact are found, in the neighbourhood of the equator.

14. As the alternate motion of the tides has been constant and regular since the existence of the world, it is natural to think, that, at each tide, the water carries from one place to another a small quantity of matter, which falls to the bottom as a sediment, and forms those horizontal and parallel strata that every where appear. Here it may indeed be objected, that as the flux is equal to, and regularly succeeded by, the reflux, the two contrary motions will balance each other; and whatever is brought in by the flux will be carried back by the reflux. The motion of the ocean, therefore, could never be the cause of the formation even of parallel strata; much less of mountains, and all the inequalities to be observed in this globe. To this Mr Buffon replies, that the alternate motion of the waters is by no means equal; for the sea has a continual motion from east to west: the agitations occasioned by the winds likewise produce great inequalities in the tides. It must also be acknowledged, that, by every motion of the sea, particles of earth and other matter must be carried from one place and

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deposited in another; and that these collections of matter must assume the form of parallel and horizontal strata. Lastly, this objection is obviated by a well known fact. On all coasts where the ebbing and flowing of the sea is discernible, numberless materials are brought in by the flux, which are not carried back by the reflux. The sea gradually increases on some places and recedes from others; narrowing its limits by depositing earth, sand, shells, &c. which naturally take a horizontal position. These materials when accumulated, and elevated to a certain degree, gradually shut out the water, and remain for ever in the form of dry land.

15. The possibility of a mountain's being formed at the bottom of the sea by the motion and sediments of the water, will appear from the following considerations. On a coast which the sea washes with violence during the flow of tide, some part of the earth must be carried off at every stroke of the waves. Even where the sea is bounded by a rock, it is a known fact, that the rock itself is greatly wasted by the water; and consequently that small particles are carried off by the retreat of every wave. Those particles of earth or stone are necessarily transported to some distance. Whenever the agitation of the water ceases, the particles are precipitated in the form of a sediment, and lay the foundation of a first stratum, which is either horizontal or inclined, according to the situation of the surface on which they fall. This stratum is soon succeeded by another, produced by the same cause; and thus a considerable quantity of matter will be amassed, and deposited in parallel beds. In process of time this gradually accumulating mass will become a mountain in the bottom of the sea, exactly resembling, both in external and internal structure, those mountains which we see on the dry land. If there happened to be shells in that part of the bottom of the sea where we have supposed the sediments to be deposited, they will be covered, filled, and incorporated with the deposited matter, and form a part of the general mass. These shells will be lodged in different parts of the mountain, corresponding to the times in which they were deposited: those which lay at the bottom before the first stratum was formed, will occupy the lowest station; the others will be found in places more elevated.

16. It has been imagined that the agitation of the sea produced by the winds and tides is only superficial, and does not affect the bottom, especially where it lies very deep. But it ought to be remembered, that whatever be the depth, the whole mass is put in motion by the tides at the same time; and that, in a fluid globe, this motion would be communicated even to the centre. The attractive power, which occasions the flux and reflux, is penetrating. It acts equally upon every particle of the mass; so that the quantity of its force at different depths may be determined by calculation. We cannot therefore hesitate in pronouncing, that the tides, the winds, and all other causes of motion in the sea, must produce heights and inequalities in its bottom; and that these heights must uniformly be composed of regular strata either horizontal or inclined. The heights thus produced will gradually augment; like the waves which formed them, they will mutually respect each other; and if the extent of the

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17. Whenever eminences are formed, they interrupt the uniform motion of the waters, and produce currents. Between two neighbouring heights in the bottom of the ocean there must be a current which will follow their common direction, and, like a river, cut a channel, the angles of which will be alternately opposite through the whole extent of its course. These heights must continually increase: for, during the flow, the water will deposit its ordinary sediment upon their ridges; and the waters which are impelled by the current will force along, from great distances, quantities of matter, which will subside between the hills, and, at the same time, scoop out a valley with corresponding angles at their foundation. Now, by means of these different motions and sediments, the bottom of the ocean, though formerly smooth, must soon be furrowed and interperfed with hills and chains of mountains, as we actually find it at present. The soft materials of which the eminences were originally composed, would gradually harden by their own gravity. Such of them as consisted of sandy and crystalline particles would produce those enormous masses of rock and flint, in which we find crystals and other precious stones. Others, composed of stony particles mixed with shells, give rise to those beds of limestone and marble in which vast quantities of sea-shells are still found incorporated.

18. These causes, as before observed, act with greater force under the equator than in other climates; for there the tides are higher, and the winds more uniform. The mountains of Africa and Peru are the highest in the world; often extending through whole continents, and stretching to great distances under the waters of the ocean. The mountains of Europe and Asia, which extend from Spain to China, are not so high as those of Africa and South America. According to the relations of voyagers, the mountains of the north are but small hills, when compared with the mountains of the equatorial regions. Those prodigious chains of mountains which run from east to west in the old continent, and from north to south in the new, must have been formed by the general motion of the tides. But the origin of the less considerable hills must be ascribed to particular motions occasioned by winds, currents, and other irregular agitations of the sea.

Having thus discussed some very important points respecting the theory of the earth, our author now proceeds to answer other questions which seem still more difficult of solution.

19. But how has it happened that this earth, which we and our ancestors have inhabited for ages, which, from time immemorial, has been an immense continent, dry, compact, and removed from the reach of water, should, if formerly the bottom of an ocean, be now exalted to such a height above the waters, and so completely separated from them? Since the waters remained so long upon the earth, why have they now deserted it? What accident, what cause, could introduce a change so great? A little reflection, says he, will furnish us with at least plausible solutions to these seemingly so difficult questions. We daily observe the sea gaining ground on certain coasts, and losing it on o-

thers. We know that the ocean has a general and uniform motion from east to west: that it makes violent efforts against the rocks and low grounds which encircle it; that there are whole provinces which human industry can hardly defend against the fury of the waves; and that there are instances of islands which have but lately emerged from the waters, and of regular inundations. History informs us of inundations and deluges of a more extensive nature. Ought not all this to convince us, that the surface of the earth has experienced very great revolutions, and that the sea may have actually given up possession of the greatest part of the ground which it formerly occupied? For example, let us suppose, that the old and new worlds were formerly but one continent; and that, by a violent earthquake, the ancient Atlantis of Plato was sunk. The consequence of this mighty revolution must necessarily be, that the sea would rush in from all quarters, and form what is now called the *Atlantic Ocean*; and vast continents, perhaps those we now inhabit, would of course be left dry. This great revolution might be effected by the sudden failure of some immense cavern in the interior parts of the globe, and an universal deluge would infallibly succeed.

20. But, however conjectures of this kind may stand, it is certain that such a revolution hath happened: and we may even believe that it hath happened naturally; for if a judgment of the future is to be formed from the past, we have only to attend carefully to what passes before our eyes. It is a fact established by the repeated observation of voyagers, that the ocean has a constant motion from east to west. This motion, like the trade-winds, is not only perceived between the tropics, but through the whole temperate climates, and as near the poles as navigators have approached. As a necessary consequence of this motion, the Pacific Ocean must make continual efforts against the coasts of Tartary, China, and India; the Indian Ocean must act against the east coast of Africa; and the Atlantic must in a similar manner act against all the eastern coasts of America. Hence the sea must have gained, and will always continue to gain, on the east, and to lose on the west. This of itself would be sufficient to prove the possibility of the change of the sea into land, and land into sea. If such is the natural effect of the sea's motion from east to west, may it not reasonably be supposed, that Asia, and all the eastern continent, is the most ancient country in the world? and that Europe, and part of Africa, especially the west parts of these continents, as Britain, France, Spain, &c. are countries of a more recent date?

21. The cause of the perpendicular fissures with which the earth abounds, is easily investigated. As various materials constituting the different strata were transported by the waters, and deposited in the form of sediments, they would at first be in a very diluted state, and would gradually harden and part with the superfluous quantity of moisture they contained. In process of time, drying, they would naturally contract and split at irregular distances. These fissures necessarily assumed a perpendicular direction: because in this direction the action of gravity of one particle upon another is equal to nothing; but it acts directly opposite to this description, in a horizontal situation: the di-

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minution in bulk could have no sensible effect but in a vertical line. The contraction of the parts in drying, therefore, and not the contained water forcing an issue, as has been alleged by some, is the cause of perpendicular fissures; for it may be often remarked, that the sides of those fissures, through their whole extent, correspond as exactly as the two sides of a split piece of wood.

22. Perpendicular fissures vary greatly as to the extent of their openings. Some are about half an inch or an inch; others a foot or two feet; some extend several fathoms, and give rise to those vast precipices which so frequently occur between opposite parts of the same rocks, in the Alps and other high mountains. It is plain, that the fissures, the openings of which are small, have been occasioned solely by drying. But those which extend several feet are partly owing to another cause; namely, the sinking of the foundation upon one side, while that of the other remains firm. If the base sinks but a line or two, when the height is considerable, an opening of several feet, or even fathoms, will be the consequence. When rocks are founded on clay or sand, they sometimes slip a little to one side; and the fissures are of course augmented by this motion.

23. The large openings, however, and prodigious cuts, which are to be met with in rocks and mountains, are to be ascribed to another cause. They could be produced no other way than by the sinking of immense subterraneous caverns, that were unable any longer to sustain their incumbent load. But these cuts or intervals in mountains are not of the same nature with the perpendicular fissures: they appear to have been ports opened by the hand of nature for the communication of nations. This seems to be the intention of all large openings in chains of mountains, and of those straits by which different parts of the ocean are connected; as the straits of Thermopylæ, of Gibraltar, &c. the gaps or ports in mount Caucasus, the Cordeleras, &c.

24. But the greatest changes upon the surface of the earth are occasioned by rains, rivers, and torrents from the mountains. These derive their origin from vapours raised by the sun from the surface of the ocean, and which are transported by the winds through every climate. The progress of these vapours, which are supported by the air, and transported at the pleasure of the winds, is interrupted by the tops of the mountains, where they accumulate into clouds, and fall down in the form of rain, dew, or snow. At first, these waters descended into the plains without any fixed course; but they gradually hollowed out proper channels for themselves. By the power of gravity they ran to the bottom of the mountains; and penetrating or dissolving the lower grounds, they carried along with them sand and gravel, cut deep furrows in the plains, and thus opened passages to the sea, which always receives as much water by rivers as it loses by evaporation. The windings in the channels of rivers have uniformly corresponding angles on their opposite banks; and as mountains and hills, which may be regarded as the banks of the valleys by which they are separated, have likewise sinuosities with corresponding angles, this circumstance seems to demonstrate, that the valleys have been gradually formed by currents of the ocean, in the same manner as the channels of ri-

vers have been produced. Rivers produce considerable changes on the surface of the earth; they carry off the soil, wear away the most solid rocks, and remove every thing that opposes their passage. The waters of the clouds also, which descend upon the mountains, by continually washing away some part of the earth, tend to level them with the plains; and would undoubtedly do so, if time enough were allowed for that purpose.

25. From what has been advanced, we may conclude, that the flux and reflux of the ocean have produced all the mountains, valleys, and other inequalities on the surface of the earth: that currents of the sea have scooped out the valleys, elevated the hills, and bestowed on them the corresponding directions: that the same waters of the ocean, by transporting and depositing earth, &c. have given rise to the parallel strata: that the waters from the heavens gradually destroy the effects of the sea, by continually diminishing the height of the mountain, filling up the valleys, and choking up the mouths of rivers; and by reducing every thing to its proper level, they will in time restore the earth to the sea, which by its natural operations will again create new continents interperfed with mountains and valleys, and every way similar to those which we now inhabit.

Thus far our author preserves some degree of plausibility in his reasoning; but in his account of the original formation of the earth, he certainly goes to the utmost verge of probability, or rather of possibility, in his suppositions. According to him, all the planets in our system were originally parts of the sun himself. They were detached from his body all at once by a mighty stroke of a comet. The possibility of driving off such a quantity of matter from the sun by a single stroke, he labours hard to prove; but this is far from being the greatest difficulty in his system.—“To this theory (says he) it may be objected, that if the planets had been driven off from the sun by a comet, in place of describing circles round him, they must, according to the law of projectiles, have returned to the same place from whence they had been forced; and, therefore, that the projectile force of the planets cannot be attributed to the impulse of a comet.

“I reply, that the planets issued not from the sun in the form of globes, but in the form of torrents; the motion of whose anterior particles behaved to be accelerated by those behind, and the attraction of the anterior particles would also accelerate the motion of the posterior; and that this acceleration, produced by one or both of these causes, might be such as would necessarily change the original motion arising from the impulse of the comet; and that, from the cause, might result a motion similar to what takes place in the planets; especially when it is considered, that the shock of the comets removes the sun out of its former station. This reasoning may be illustrated by an example. Suppose a musket-ball discharged from the top of a mountain, and that the force of the powder was sufficient to send it beyond a semidiameter of the earth: it is certain that this ball would revolve round the earth, and return at every revolution to the place from whence it had been discharged. But, instead of a musket-ball, if a rocket were employed, the continued action of the fire would greatly accelerate the

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original impulsive motion. This rocket would by no means return to the same point like the ball; but, *cæteris paribus*, would describe an orbit, the perigee of which would be more or less distant from the earth in proportion to the greatness of the change produced in its direction by the accelerating force of the fire. In the same manner, if the original projectile force impressed by the comet on the torrent of solar matter was accelerated, it is probable that the planets formed by this torrent acquired their circular or elliptical movements around the sun."

In like manner he accounts for the formation and circulation of the secondary planets. The revolutions of the primaries on their axes, he accounts for from the obliquity of the original stroke impressed by the comet. The oblate spheroidal figure of the earth is easily deduced from its diurnal motion, and the fluidity of the whole at its first formation. The flattening at the poles he estimates at about one 230th part of the whole. As this computation differs considerably from the account given by the mathematicians who were sent to different parts of the world on purpose to determine the figure of the earth, and who made the flatness at the poles equal to one 175th part of the whole, he supposes this difference to have arisen from changes that have since taken place on the surface of the earth, occasioned by the causes already mentioned. He then proceeds to account for the formation of all things, in the following manner.—"It is therefore evident, that the earth assumed its figure when in a melted state; and, to pursue our theory, it is natural to think, that the earth, when it issued from the sun, had no other form but that of a torrent of melted and inflamed matter: that this torrent, by the mutual attraction of its parts, took on a globular figure, which its diurnal motion changed into a spheroid: that when the earth cooled, the vapours, which were expanded like the tail of a comet, gradually condensed, and fell down in the form of water upon the surface, depositing at the same time a slimy substance mixed with sulphur and salts; part of which was carried by the motion of the waters into the perpendicular fissures of the strata, and produced metals; and the rest remained on the surface, and gave rise to the vegetable mould which abounds in different places, with more or less of animal or vegetable particles, the organization of which is not obvious to the senses.

"Thus the interior parts of the globe were originally composed of vitrified matter; and, I believe, they are so at present. Above this vitrified matter were placed those bodies which the fire had reduced to the smallest particles, as sands, which are only portions of glafs; and above these pumice-stones and the scoria of melted matter, which produced the different clays. The whole was covered with water to the depth of 500 or 600 feet, which originated from the condensation of the vapours when the earth began to cool. This water deposited a stratum of mud, mixed with all those matters which are capable of being sublimed or exhaled by fire: and the air was formed of the most subtle vapours, which, from their levity, rose above the water.

"Such was the condition of the earth when the tides, the winds, and the heat of the sun, began to introduce changes on its surface. The diurnal motion

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of the earth, and that of the tides, elevated the waters in the equatorial regions, and necessarily transported thither great quantities of slime, clay, and sand; and by thus elevating those parts of the earth, they perhaps sunk those under the poles about two leagues, or a 230th part of the whole, as was formerly remarked: for the waters would easily reduce into powder pumice-stones, and other spongy parts of the vitrified matter upon the surface; and by this means excavate some places and elevate others, which, in time, would produce islands and continents, and all those inequalities on the surface, which are more considerable towards the equator than towards the poles. The highest mountains lie between the tropics and the middle of the temperate zones, and the lowest from the polar circles towards the poles. Indeed, both the land and sea have most inequalities between the tropics, as is evident from the incredible number of islands peculiar to those regions."

V. In the first volume of the Edinburgh Philosophical Transactions a new theory of the earth has been laid down at considerable length by Dr Hutton; of which the following is an abstract.

The general view of the terrestrial system conveys to our minds an idea of a "fabric, erected in wisdom, to obtain a purpose worthy of the power that is apparent in the production of it."

The end for which it was formed, as far as we can comprehend our author's meaning, is, that it might be an habitation for living creatures; and we are enabled to understand the constitution of this earth as a thing formed by design, "not only by seeing those general operations which depend on its construction as a machine, but also by perceiving how far the particulars in the construction of that machine depend on the operations of the globe."

In taking a comprehensive view of the mechanism of the globe, we observe three principal parts of which it is composed; and which, by being properly adapted to one another, form it into an habitable world. These are the solid body of the earth, the waters of the ocean, and the atmosphere surrounding the whole. On these our author observes,

1. The parts of the terrestrial globe more immediately exposed to our view are supported by a central body commonly supposed, but without any good reason, to be solid and inert.

2. The aqueous part, reduced to a spherical form by gravitation, has become oblate by the earth's centrifugal force. Its use is to receive the rivers, be a fountain of vapours, and to afford life to innumerable animals, as well as to be the source of growth and circulation to the organized bodies on earth.

3. The irregular body of land, raised above the level of the sea (though the smallest of these large divisions), is by far the most interesting, as immediately necessary to the support of animal life.

4. The atmosphere surrounding the whole is evidently necessary for innumerable purposes of life and vegetation, neither of which could subsist a moment without it.

Having thus considered the mechanism of the globe, Dr Hutton proceeds to investigate the powers by which it is upheld.—These are the gravitating and uphelling, projectile forces by which the planets are guided, the

H h

influence

Earth.

18
Dr Hutton's theory of the earth.19
Earth form.20
Composition of the three principal parts.

Earth.

22
Why the
land must
necessarily
decay, and
at last be
destroyed.

influence of light and heat, cold and condensation; to which may be added electricity and magnetism.

In the further pursuit of our general or preparatory ideas, the Doctor observes, that "a solid body of land could not have answered the purpose of a habitable world, for a soil is necessary for the growth of plants; but a soil is only the materials collected from the destruction of the solid land. Therefore the surface of this land, inhabited by man, is made by nature to decay, in dissolving from the hard and compact state in which it is found below the soil; and this soil is necessarily washed away by the continual circulation of the water running from the summits of the mountains." Thus he supposes that the land must at last be entirely destroyed; a misfortune unavoidable from the very constitution of the globe as an habitable world. It remains, therefore, to be considered, whether there be, "in the constitution of this world, a reproductive operation by which a ruined constitution may be again repaired, and a duration and stability procured to the machine considered as capable of sustaining plants and animals?" The solution of this question, he says, is perhaps within the reach of human sagacity, and, as he justly observes, might add some lustre to science and the human intellect.

23
Marine animals
of much higher
antiquity
than the human
race.

With regard to the beginning of the world, though our author does not pretend to lay aside the Mosaic accounts concerning the origin of man, yet, says he, "though there has not been found in natural history any document by which a high antiquity might be attributed to the human race, this is not the case with regard to the inferior animals, particularly those which inhabit the ocean and its shores. We find in natural history monuments which prove that these animals had long existed; and we thus procure a measure for the computation of a period of time extremely remote, though far from being exactly ascertained.—Thus, in finding the relics of sea animals of every kind in the solid body of the earth, a natural history of those animals is formed, which includes a certain portion of time; and for the ascertaining this portion of time, we must again have recourse to the operations of this world.

From a view of the present construction and operations of nature, therefore, our author supposes, that we may understand what has formerly passed in the original formation of the globe; and then proceeds to reason in the following manner:

24
General
view of the
solid parts
of the globe.

The solid parts of the globe are, in general, composed of sand, gravel, argillaceous and calcareous strata, or of these mixed with some other substances. Sand is separated and fixed by streams and currents; gravel is formed by the mutual attrition of stones agitated in water; and marly or argillaceous strata have been collected by subsiding in water in which those earthy substances had floated. Thus, so far as the earth is formed of these materials, it would appear to have been the production of water, winds, and tides.

25
Earth in a
great measure
composed of the
exuvie of marine
animals.

The next inquiry of our author is into the origin of our land, which he seems willing to derive entirely from the exuvie of marine animals. The only argument he makes use of for determining this most important point is drawn from the quantity of them to be met with in the different parts of it. "We find (says he) the marks of marine animals in the most solid parts

of the earth; consequently those solid parts have been formed after the ocean was inhabited by those animals which are proper to that fluid medium."

That all the masses of marble or limestone are composed of the calcareous matter of marine bodies, he concludes, 1. From there being few in which some of those objects may not be found which indicate the marine origin of the mass; and a single cockle-shell or piece of coral found in a marble or limestone quarry, will certainly prove it to have been originally at the bottom of the sea as much as if it had been all composed of such bodies. 2. In the calcareous strata, which are evidently of marine origin, there are many parts of a sparry structure; which shows that in these places the original texture of those beds has been dissolved and a new structure assumed. This change is produced by crystallization, in consequence of a previous state of fluidity; which has so disposed the concreting parts, as to allow them to assume a regular shape and structure proper to that substance. 3. There are, in all the regions of the earth, huge masses of calcareous matter in that crystalline or sparry state, in which perhaps no vellige can be found of any organized body, nor any indication that such calcareous matter had belonged to animals; but as, in other masses, this sparry or crystalline state is evidently assumed by the calcareous matter of the marine productions, we have no reason to derive these from any other source: and hence, says our author, we are led to conclude, that all the strata of the earth, not only those consisting of such calcareous masses, but others superincumbent upon these, have had their origin at the bottom of the sea, by the collection of sand and gravel, of shells, of coralline and crustaceous bodies, and of earths and clays variously mixed, or separated and accumulated.

"The general amount of our reasoning (says he) is this; that nine-tenths perhaps, or 99 hundredths, of this earth, so far as we see, have been formed by natural operations of the globe, in collecting loose materials and depositing them at the bottom of the sea, consolidating those collections in various degrees, and either elevating those consolidated masses above the level on which they were formed, or lowering the level of that sea."

With regard to the raising of the land, thus formed at the bottom of the sea, to some height above its surface, our author differs from Buffon, and contends, that "no motion of the sea occasioned by the earth revolving in this solar system could bring about that end; for let us suppose the axis of the earth to be changed from the present poles and placed in the equinoctial line, the consequence of this might indeed be the formation of a continent of land about each new pole, from whence the sea would run towards the new equator; but all the rest of the globe would remain an ocean. Some new points might be discovered, and others which appeared before above the surface of the sea would be sunk by the rising of the water; but, on the whole, land could only be gained substantially at the poles. Nor could the continents, even supposing they had been originally produced in this manner, have continued stationary for many thousand years, and presented to us, every where below their surface, masses of consolidated marble and other mineral substances, in a state as different as possible from what they were originally. Besides an operation, therefore, by which

Earth.

26
Marble and
limestone
necessarily to
be derived
from these.

27
Almost the
whole body
of earth
formed at
the bottom
of the sea.

28
Could not
be raised
from thence
by any motion
of the
water.

Earth.

the earth at the bottom of the sea should be converted into an elevated land, or placed high above the level of the ocean, there is required a consolidating power, by which the loose materials that had subsided from water should be formed into masses of the most perfect solidity, having neither water nor vacuity betwixt their constituent parts, nor in the pores of, these constituent parts themselves.

29 Consolidating power of the strata to be discovered by an inspection of the materials themselves.

This consolidating power, he is of opinion, must lie out of the reach of common observation, because the consolidated masses on the surface of the earth are now in a state of decay; and therefore we must look into these masses themselves, in order to discover the cause by which they assumed their present form.

In entering upon the investigation of this consolidating power, our author observes, that there are only two ways in which the requisite changes can happen, viz. simple congelation from a fluid state, or a continual accretion of solid particles. Fire and water, therefore, may be considered as the general agents in this operation; and we are to consider whether they have acted in the way of aqueous solution and crystallization, or in that of fusion. If the former of these ways is supposed to be that in which the strata in general have been consolidated, we may look for a considerable degree of uniformity in its effects. "The action of water (he says) upon all different substances is what we are well acquainted with; and there is no reason to conclude any thing mysterious in its operation, unless we suppose an immense compressing power to have some effect in altering it. Compression, however (he says), only alters the relation of evaporation to heat, or changes the degree of heat which water can contain. We are therefore to look for no occult quality in water acting at the bottom of the sea more than on the surface of the earth. Time, indeed, may do a great deal where the course of the operation is slow; but where it is contrary to the nature of the things to produce the change in question, it is plain that no length of time can have any effect."

31 Difficulties attending this supposition.

Again, if the masses have been consolidated by crystallization, the bodies must first have been dissolved in water as a menstruum; and therefore another power is to be sought for by which the water might again be extricated from those endless labyrinths in which the solid matter of the strata is deposited, without leaving a fluid particle in its composition. There is likewise another difficulty in finding a source from whence the vast quantity of matter deposited in these strata should be derived. Besides, the water contained in the cavities and interstices of these bodies composing strata must be in a stagnating state; and consequently it can only act on the surface of those cavities which are to be filled up. "But with what are they to be filled? Not with water; they are full of this already: Not with the substance of those bodies which contain the water; this would be only to make one cavity in order to fill up another. If, therefore, the cavities of the strata are to be filled with solid matter by means of water, there must be made to pass through these porous masses water impregnated with some other substances in a dissolved state, and the aqueous menstruum must be separated from the dissolved substance, and to deposit the same in cavities through which the solution moves." This supposition is, however, according to

Earth.

our author, inadmissible; for, in the case of materials accumulated in the bottom of the ocean, there is no proper means for separating the dissolved matter from the water included in these enormous masses; nor are there any means by which a circulation in those masses may be formed.

In the further prosecution of his subject, our author informs us, that "if water had been the menstruum by which the consolidating matter was introduced into the cavities of the strata, masses of those bodies that are soluble in water could only be found consolidated; and these only in such a state as the simple separation of the dissolving water might produce. But this is far from being the case. We have strata consolidated by calcareous spar; a thing perfectly distinguishable from the stalaetical concretion of the calcareous earth in consequence of aqueous solution. We have strata made solid by the formation of fluor; a substance, so far as we know, not soluble in water. We have strata consolidated with sulphureous and bituminous substances, which do not correspond to the solution in water. We have strata consolidated with siliceous matter in a state totally different from that in which it is deposited by water; we have them also consolidated by almost all the various metallic substances, with their almost endless mixtures and sulphureous compositions; that is to say, we find perhaps every different substance introduced into the interstices of strata which had been formed by subsidence at the bottom of the sea."

32 Strata consolidated by substances insoluble in water.

For these reasons, our author thinks it more probable that the strata have been consolidated by heat and fusion; and this hypothesis, he imagines, will solve every difficulty. And as the question is of the greatest importance to natural history, he proposes to investigate it at great length; at the same time that the subject is generalized as much as possible.

33 These probably consolidated by heat and fusion.

He considers, that among the various strata which compose the earth, we find some strata formed of siliceous and some of sulphureous materials; and with one or other, or both of these substances, the strata are so intimately mixed, that what has changed the siliceous or sulphureous materials from a fluid to a solid state, must likewise have materially affected the strata which contain them. The former he looks upon to be absolutely insoluble in water; and there are many other bodies whose solubility is so small, that it could not be discovered but by means of the siliceous matter. Of this an instance is adduced in the feldspar, a compound of siliceous, argillaceous, and calcareous earth, intimately united together; which being for ages exposed to the weather, the calcareous part is dissolved, and the siliceous left in form of a white soft earth; though it is uncertain whether this dissolution be performed by means of pure water, or whether an acid be also concerned. Siliceous matter is undoubtedly contained in the water of the boiling fountain of Geyser in Ireland; but he thinks that here it must be dissolved by an alkali, one of the natural solvents of this earth. "It may therefore be asserted (says he), that no siliceous body having the hardness of flint, nor any crystallization of that substance, has ever been formed except by fusion. If by any art this substance shall be dissolved in simple water, or made to crystallize from any solution, in that case the assertion which has been here made may be denied."

34 Siliceous bodies supposed absolutely insoluble by water.

He considers, that among the various strata which compose the earth, we find some strata formed of siliceous and some of sulphureous materials; and with one or other, or both of these substances, the strata are so intimately mixed, that what has changed the siliceous or sulphureous materials from a fluid to a solid state, must likewise have materially affected the strata which contain them. The former he looks upon to be absolutely insoluble in water; and there are many other bodies whose solubility is so small, that it could not be discovered but by means of the siliceous matter. Of this an instance is adduced in the feldspar, a compound of siliceous, argillaceous, and calcareous earth, intimately united together; which being for ages exposed to the weather, the calcareous part is dissolved, and the siliceous left in form of a white soft earth; though it is uncertain whether this dissolution be performed by means of pure water, or whether an acid be also concerned. Siliceous matter is undoubtedly contained in the water of the boiling fountain of Geyser in Ireland; but he thinks that here it must be dissolved by an alkali, one of the natural solvents of this earth. "It may therefore be asserted (says he), that no siliceous body having the hardness of flint, nor any crystallization of that substance, has ever been formed except by fusion. If by any art this substance shall be dissolved in simple water, or made to crystallize from any solution, in that case the assertion which has been here made may be denied."

35 Probably dissolved by an alkali in the fountain of Geyser.

H h 2

But

Earth.

36
Bodies penetrated by flinty matter in fusion.

37
Exemplified in chalk;

38
In petrified wood.

39
Why the wood has not been penetrated by flint in a state of solution.

But besides this proof he adduces another, supposed to be more direct; and that is, the penetration of many bodies with a flinty substance, which, according to every collateral circumstance, must have been performed by the flinty matter in a state of simple fusion, and not in a state of suspension by any solvent. Flinty bodies are found perfectly insulated in strata of chalk and sand; and here our author determines that it is *not possible* that flint matter could be conveyed into the middle of these strata by a menstruum in which it was dissolved, and thus deposited in that place, without the smallest trace of deposition in the neighbouring parts. The form of these bodies also demonstrates, in his opinion, "1. That they have been introduced among those strata in a fluid state, by injection from some other place; 2. That they have been dispersed in a variety of ways among those strata then deeply immersed at the bottom of the sea; and, 3. That they have been there congealed from the state of fusion, and have remained in that situation, while those strata have been removed from the bottom of the ocean to the surface of the present land."

There are also specimens brought from many different places, which contain in themselves *the most evident marks of this injection of the flinty substance in a fluid state*; and these are pieces of *fossil wood* brought from England, Germany, and Loch Neagh in Ireland. Sometimes those specimens appear to have been previously penetrated by an iron or calcareous matter, and sometimes not: "the injected flint, however (says he), appears to have penetrated the body of this wood immersed at the bottom of the sea, under an immense compression of water. This appears from the wood being penetrated partially, some parts not being penetrated at all. Now, in the limits betwixt these two parts, we have the most convincing proofs that it had been flint in a simple fluid state which had penetrated the wood, and not in a state of solution."

"First, Because, however little of the wood is left unpenetrated, the division is always distinct between the injected part and that which is not penetrated by the fluid flint. In this case the flinty matter has proceeded a certain length, which is marked, and no farther; and beyond this boundary there is no partial impregnation, nor a gradation of the flintifying operation, as there must have been if siliceous matter had been deposited from a solution. 2dly, The termination of the flinty impregnation has assumed such a form precisely as would have happened naturally from a fluid flint penetrating that body."

"In other specimens of this mineralizing operation, fossil wood, penetrated more or less with ferruginous or calcareous substance, has been afterwards penetrated with a flinty substance. In this case, with whatever different substances the woody body shall be supposed to have been penetrated in a state of solution by water, the regular structure of the plant would still have remained, with its vacuities variously filled with the petrifying substances, separated from the aqueous menstruum, and deposited in the vascular structure of the wood."

"There cannot be a doubt with regard to the truth of this proposition; for, as it is, we frequently find parts of the consolidated wood with the vascular structure remaining perfectly in its natural shape and situation; but if it had been by aqueous solution that the

wood had been penetrated and consolidated, all the parts of that body would be found in the same natural shape and situation.

"This, however, is far from being the case; for while in some parts the vascular structure is preserved entire, it is also evident, that in general the woody structure is variously broken and dissolved by the fusion and crystallization of the flint."

With regard to the second kind of substances to be considered, and which are called by our author *sulphureous*, he tells us, "that they are not soluble in water so far as we know, but fusible by heat, and inflammable by means of heat and vital air. They are either more simple or more compound. The former consist of phlogiston united either with acid or metallic substances, the one forming sulphur, properly so called, the other metals. The more compound kind are composed of oily matter produced by vegetables, and forming bituminous substances."

"Sulphur is found naturally combined with metals, which are said to be mineralized by it; and it is well known that this mineralization is performed by means of heat and fusion; nor will any person skilled in chemistry pretend to say that this is done in the way of aqueous solution. The combination of iron and sulphur, for instance, may be easily performed by fusion; but this compound is resolved into a vitriolic salt by aqueous solution."

Our author further remarks, that unless all the substances of this kind were soluble in water, we ought not to say that any one of them is formed by aqueous solution; for there is such a continued chain of connection between them, that all must have been formed either by aqueous solution or by means of heat and fusion. In one mass, for instance, we find, 1. Pyrites, containing sulphur, iron, and copper: 2. Blend, consisting of iron, sulphur, and calamine: 3. Galena, consisting of lead and sulphur: 4. Marmor metallicum, consisting of terra ponderosa saturated with the vitriolic acid, a substance insoluble in water: 5. A saturation of calcareous earth with the acid of fluor, forming a substance likewise insoluble in water: 6. Calcareous spar of different kinds, being calcareous earth saturated with fixed air, and something also which makes a variety: And, lastly, Siliceous substance, or quartz crystals. Unless, therefore, every one of these different substances were soluble in water, and crystallizable from it, we will look in vain for any explanation of these appearances by means of aqueous solution; while heat being capable of rendering all these substances fluid, they may be with the greatest facility transported from one place to another; and they may be made to congregate altogether at the same time, and distinctly separate in any place."

But what puts the matter beyond all doubt with our author, is a specimen of ore taken from an Hungarian mine, and which contains petro-felix, pyrites, and cinabar, so mixed together and crystallized upon one another, that it is impossible to conceive any one of these bodies to have had its fluidity and concretion from a cause which had not affected the other two. "Now (says our author), let those who would deny the fusion of this siliceous body explain how water could dissolve these three different bodies, and deposit them in their present shape. If, on the contrary, they have

Earth.

40
Of the fulphureous substances.

41
Metals cannot be mineralized by aqueous solution.

42
Exemplified in different substances.

43
Supposed proof from an Hungarian mine.

Earth.

have not the least shadow of reason for such a gratuitous supposition, the present argument must be admitted in its full force."

44 From the existence of native metals in the earth.

The next argument in favour of our author's doctrine is drawn from the existence of metallic bodies in their malleable state in the bowels of the earth. In this situation they are also commonly attended with such evident marks of fusion, that it is impossible to deny their having been really melted; and for the truth of this he appeals, among a thousand instances, to the great native mass of iron found by Dr Pallas in Siberia.

45 Of bituminous bodies.

Oily or bituminous bodies are found variously intermixed with mineral substances, as well as forming distinct strata of themselves. Vegetables afford oily and resinous matters; which being collected at the bottom of the ocean are there formed into strata, afterwards changed by various degrees of heat, and the evaporation of their more fluid parts.

46 Why these bodies are not altered by heat while under water.

"In order to understand this (says our author), it must be considered, that, while immersed in water, and under insuperable compression, the vegetable, oily, and resinous substances would appear to be unalterable by heat; and it is only in proportion as certain chemical separations take place, that those inflammable bodies are changed in their substance by the application of heat. Now, the most general change of this kind is by evaporation, or the distillation of their more volatile parts; by which oily substances become bituminous, and bituminous substances become coaly. There is here a gradation, which is best understood by comparing the two extremes. On the one hand, we know by experiment, that oily and bituminous substances can be melted, and partly changed into vapour by heat; and that they become harder and denser in proportion as the more volatile parts have evaporated from them. On the other hand, coaly substances are destitute of fusibility and volatility, in proportion as they have been exposed to greater degrees of heat, and to other circumstances favourable to the dissipation of their more volatile and fluid parts. If, therefore, in mineral bodies we find the two extreme states of this combustible substance, and also the intermediate states, we must either conclude that this particular operation of heat has been thus actually employed in nature, or we must explain those appearances by some other means in as satisfactory a manner, and so as shall be consistent with other appearances. In this case it will avail nothing to have recourse to the false analogy of water dissolving and crystallizing salts, which has been so much employed for the explanation of other mineral appearances. The operation here in question is of a different nature, and necessarily requires both the powers of heat and proper conditions for evaporation. Therefore, in order to decide the point with regard to what is the power in nature, by which mineral bodies have become solid, we have only to find a bituminous substance in the most complete state of coal, intimately connected with some other substance which is more generally found consolidating the strata, and assisting in the concretion of mineral substances. A most undoubted proof of this kind our author has in his possession, viz. a mass in which are blended together coal of the most fixed kind, quartz, and marmor metallicum. The specimen also

47 Proof that bituminous substances have been consolidated by heat.

is contained in a rock, which every naturalist, he says, will allow to have been produced by fire and fusion.

Earth.

The strata of fossil coal are found in almost every intermediate state, as well as in those of bitumen and charcoal. Of the former kind is that fossil coal which melts and becomes fluid by heat; of the latter, is that species found both in Wales and Scotland, which is perfectly infusible in the fire, and burns like coals without flame or smoke. The former abounds in oily matter; the latter has been distilled by heat until it has become a *caput mortuum*, or perfect coal. The more volatile parts of these bodies are sometimes found in their separate state. Thus at Raith in Fifehire, there is a stratum of limestone, which, though but slightly tinged with a black colour, contains bituminous matter like pitch, in many cavities which are lined with calcareous spar crystallized. Now, it is to be observed, that had the cavity in the solid limestone or marble, which is lined with calcareous crystals containing pyrites, been thus incruited by means of filtration with water, this water must have dissolved calcareous spar, pyrites, and bitumen. But these natural appearances would not even be solved by this hypothesis of dissolution and filtration of these substances. There is also required, first, a cause for the separation of these different substances from the aqueous menstruum. 2. An explanation of the way in which a bitumen should be formed into hard round bodies (our author has a specimen of this kind) of the most solid structure; and, lastly, some probable means for this complicated operation being performed below the bottom of the ocean, in the close cavity of a marble stratum.

Having thus run through his course of argument for the probability of the strata of earth being formed by heat and fusion rather than by aqueous solution, our author proceeds to the examination of a phenomenon in the mineral kingdom, which may be thought inconsistent with what he has advanced; viz. the existence of great masses of salt in the bowels of the earth. On this subject he observes, that the formation of masses of salt at the bottom of the sea, without the assistance of subterranean fire, is not a thing unpossessible as at first sight might appear. "Let us but suppose a rock placed across the gut of Gibraltar (a case novissime unnatural), and the bottom of the Mediterranean would be certainly filled with salt; because the evaporation from the surface of that sea exceeds the measure of its supply. But strata of salt formed in this manner at the bottom of the sea are as far from being consolidated by means of aqueous solution as a bed of sand in the same situation; and we cannot suppose the consolidation of such a stratum of salt by means of water, without supposing subterranean heat employed to evaporate the brine which would successively occupy the interstices of the saline crystals. But this, it may be observed, is equally departing from the natural operation of water as the means for consolidating the sediment of the ocean, as if we were to suppose the same thing done by heat and fusion. For the question is not, if subterranean heat be of sufficient intensity for the purpose of consolidating strata by the fusion of their substances; but, whether it be by means of this agent, subterranean heat, or by water alone, without the operation of a melting.

48

Formation of the different kinds of coal.

49

Stratum containing liquid bituminous matter in Fifehire.

50

On the production of fusible salts by fusion.

Barth.

melting heat, that those materials have been variously consolidated?"

51
From the
appearance
of the salt-
rock in
Cheshire.

The Doctor now attempts to prove, from the appearance of the faline strata, that they have been formed by subterraneous heat and fusion as well as the others. "The falt-rock in Cheffire lies in strata of red marl. It is horizontal in its direction, and is dug 30 or 40 feet deep. The body of this rock is perfectly solid, and the falt in many places pure, colourless, and transparent, breaking with a sparry, cubical texture: but the greatest part is tinged by the admixture of the marl, and that in various degrees, from the slightest tinge of red to the most perfect opacity. Thus the rock appears as if it had been a mass of fluid falt, in which had been floating a quantity of marly substance not uniformly mixed, but every where separating and subdividing from the faline substance. There is also to be observed a certain regularity in the separation of the tinging from the colourless substance; which, at a proper distance, gives to the perpendicular section of the rock a distinguishable figure in its structure. When looking at this appearance near the bottom of the rock, it first presented the figure of regular stratification; but upon examining the whole mass of rock, this stratification was found only to take place near the bottom. At the top of the rock, the most beautiful figure, though the most distant from stratification, was observed. It was all composed of concentric circles, and these appeared to be the section of a mass made up entirely of concentric spheres, like those beautiful systems of configuration which agates so frequently present us with in miniature. In about eight or ten feet from the top, the circles growing large, were blended together, and gradually lost their regular appearance, until at a greater depth they again assumed that of a regular stratification. This regular arrangement of the floating marly substance in the body of the falt, which is that of the structure of a coated pebble, or that of concentric spheres, is altogether inexplicable upon any other supposition than the perfect fluidity or fusion of the falt, and the attractions and repulsions of the contained substances. It is in vain to look in the operations of solution and evaporation for that which nothing but perfect fluidity and fusion can explain.

52
From the
mineral al-
kali on Te-
neriff.

“This example of a mineral salt congealed from a melted state, may be confirmed by another argument suggested by Dr Black, *viz.* an alkaline salt found in a mineral state, and described in the Philosoph. Transa. for 1771. The fossil alkali crystallizes from a dissolved state, in combining itself with a large quantity of water, in the manner of alum: and in this case the water is essential to the constitution of that solid crystalline body; for, upon the evaporation of the water, the transparent salt loses its solidity, and becomes a white powder. If, instead of being gently dried, the crystalline salt is suddenly exposed to a sufficient degree of heat (that is, somewhat more than the heat of boiling water), it enters into the state of aqueous fusion, and boils, emitting the water by means of which it had been crystallized in the cold, and rendered fluid in that heated state. It cannot be crystallized from a dissolved state without the combination of that quantity of water; nor can that water be separated without destroying its crystalline state. But in this mineral specimen we have a solid crystalline salt, with

structure which, upon examination, appears to be sparry and radiated like the zeolite. It contains no water in its crystallization, but melts in a sufficient heat without any aqueous fusion. Therefore this salt must have been in a fluid state of fusion immediately before its congelation and crystallization.

“Another example may be drawn from the iron-^{\$3\$}stone, which is commonly found among the argillaceous frata attendant upon fossil coal, both in Scotland and England. This stone is generally found among the bituminous schistus or black argillaceous frata, either in separate masses of various shapes and sizes, or forming of itself frata which are more or less continuous in their direction among the schistus or argillaceous beds. This mineral contains in general from 40 to 50 per cent. of iron, and it loses near one-third of its weight in calcination. Before calcination it is of a grey colour, is not penetrable by water, and takes a polish. In this state therefore it is perfectly solid; but being calcined, it becomes porous, red, and tender. The fact to be proved with regard to these iron stones is, that they have acquired their solid state from fusion, and not in concreting from any aqueous solution. A species of this kind of stone is found at Aberlady in East Lothian, resembling an oblate or much compressed sphere, and the size from two or three inches diameter to more than a foot. In the circular or horizontal section they present the most elegant septarium: and from the examination of this particular structure, the following conclusions may be drawn.

"1. That the septa have been formed by the uniform contraction of the internal parts of the flone, the volume of the central parts diminishing more than that of the circumference; by which means the separations of the flone diminish in a progression from the centre towards the circumference.

"2. There are only two ways in which the septa must have received the spar with which they are filled more or less; either, first, by infusation into the cavity of these septa after they were formed; or, secondly, by separation from the substance of the stone at the same time that the septa were forming.

“ Were the former of these suppositions true, ap-⁵⁵pearances would be observable, showing that the sparry of this stone substance had been admitted either through the porous structure of the stone, or through proper apertures communicating from without. Now, if either of these could not have been filled by aqueous solution, had been the case, and the stone had been consolidated from no other cause than concretion from a dissolved state, that particular structure of the stone by means of which the spar had been admitted must appear at present upon an accurate examination. This, however, is not the case; and we might rest the argument here: The septa reach not the circumference; the surface of the stone is solid and uniform in every part; and there is not any appearance of the spar in the argillaceous earth around the stone. It therefore necessarily follows, that the contraction of the iron-stone, in order to form the septa, and the filling the cavities with spar, had proceeded *pari passu*; and that this operation must have been brought about by means of fusion or by congelation from a state of simple fluidity and expansion.

"There is one fact more, which is well worth our attention; *viz.* the crystallizations which are found in
I close

Earth.

53
om iron-
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the septa
this stone
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led by a-
eous fo-
tion.

Earth.

56
Of crystalli-
zations in
cavities of
solid bodies.

57
Particular
kind of
drusen de-
scribed.

58
Other mi-
neral crys-
tallizations
described.

close cavities of the most solid bodies. These con-
cretions are well known to naturalists, and form part of
the beautiful specimens which are to be found in the
cabinets of collectors, and which the German mineral-
lists have named *drusen*." Our author, however, con-
siders only one of these species, which is of the agate
kind. It belongs to the kind of stones frequent in
this country, which are commonly called *pebbles*. Many
of them are filled with a siliceous crystallization, which
evidently proceeds from the circumference towards
the centre. Many of them again are hollow. They
are uniformly lined with crystallized substances; and
it is proper to attend to this circumstance, that the
cavity is perfectly inclosed with many solid coats im-
permeable to air or water; but particularly with the
external cortical part, which is extremely hard, takes
the highest polish, and is of the most perfect solidity,
admitting nothing but the passage of light and heat.

"Within these cavities we find, first, the coats of
crystals with which this cavity is always lined; and
this is general to all substances concreting in similar
circumstances from a state of fusion; for when thus
at liberty they naturally crystallize. 2. We have fre-
quently a subsequent crystallization set upon the first,
and more or less immersed in it. 3. There is also
sometimes a third crystallization superincumbent on
the second, in like manner as the second was upon the
first. Our author has one specimen in which the pri-
mary crystals are siliceous; the second thin foliaceous
crystals of deep red but transparent ore, forming ele-
gant figures that have the form of roses; the tertiary
crystallization is a frosting of small siliceous crystals
upon the edges of the foliaceous crystals. In other
specimens there is first a lining of colourless siliceous
crystals, then another lining of amethystine crystals,
and sometimes within that fuliginous crystals. Upon
these fuliginous and amethystine crystals are many spher-
icles or hemispheres of red compact iron-ore like hæ-
matites. In others again, the primary crystals are sil-
iceous, and the secondary calcareous. Of this kind
there is one in the Doctor's possession, which has upon
the calcareous crystals beautiful transparent siliceous
crystals, and iron sphericles upon these. He has also
an agate formed of various red and white coats, and
beautifully figured. The cavity within the coated
part of the pebble is filled up without vacuity; first
with colourless siliceous crystals; secondly, with fuli-
ginous crystals; and, thirdly, with white or colour-
less calcareous spar. But between the spar and crys-
tals there are many sphericles, seemingly of iron, half
sunk into each of these two different substances."

From the foregoing facts our author now draws the
following conclusions.

59
Conclusions
concerning
the fused
state of the
minerals.

"1. That concretion had proceeded from the sur-
face of the agate inwards. This necessarily follows
from the nature of those figured bodies, the figures of
the external coats always determining the shape of
those within, and never contrariwise, those within af-
fecting those without.

"2. That when the agate was formed, the cavity
then contained every thing which is now found in it,
and nothing more.

"3. That the contained substances must have been
in a fluid state, in order to their crystallizing.

"4. That as this fluid state had not been the effect

of solution in a menstruum, it must have been fluidity
from heat and fusion."

This is the substance of all the evidence brought by
Dr Hutton in support of his doctrine, that most of the
mineral substances with which the strata are conjoined
must have been produced by subterraneous heat, and
not from any aqueous solution. Thus far he thinks the doc-
trine is perfectly conclusive, though not altogether so
with regard to the formation of the strata themselves;
but, in order to make it apply also to these, he next
proposes to give examples of strata consolidated with-
out the introduction of foreign matter, merely by the
softening or fusion of their own materials.

For this purpose he considers the calcareous and si-
liceous strata, which are the two so much prevalent on
the surface of the globe, that all others, according to
him, may be considered as nothing: "for (says he)
unless it be the bituminous or coal strata, there is
hardly any other which does not contain more or less
of one or other of these two substances. If therefore
it can be shown, that both of these two general strata
have been consolidated by the simple fusion of their
substance, no desideratum or doubt will remain with
regard to the nature of that operation which has been
transacted at great depths of the earth, places to which
all access is denied to mortal eyes.

"We are now to prove, 1. That those strata have
been consolidated by simple fusion; and, 2. That this
operation is universal in relation to the strata of the
earth, as having produced the various degrees of hard-
ness or solidity in these bodies.

"I shall first remark, that a fortuitous collection of Consolida-
tion of a
stratum
from a for-
tuitous col-
lection of
hard bodies.
hard bodies, such as gravel and sand, can only touch
in points, and cannot while in that hard state be made
to correspond so precisely to each other's shape as to
consolidate the mass. But if these hard bodies should
be softened in their substance, or brought into a certain
degree of fusion, they might be adapted mutually to
each other; and thus consolidate the open structure
of the mass. Therefore, to prove the present point,
we have but to exhibit specimens of siliceous and cal-
careous strata which have been evidently consolidated
in this manner. Of the first kind great varieties occur
in this country. They are the consolidated strata of
gravel and sand, often containing abundance of felds-
par, and thus graduating into granite; a body, in this
respect, perfectly similar to the more regular strata
which we now examine. The second kind again are
less common, unless we consider the shells and cor-
alline bodies of our limestones as exhibiting the same
example, which indeed they do. But I have a spec-
imen of marble from Spain which will afford the most
satisfactory evidence of the fact in question.

This Spanish marble may be considered as a species of pud-
ding-stone; a species of marble which, from Mr Bowles's
Natural History, appears to be very common in Spain.
The gravel of which this marble is composed consists
of fragments of other marbles of different kinds. A-
mong these are different species of zeolites, marble,
some shell marbles, and some composed of a chalky
substance, or of undistinguishable parts. But it ap-
pears that all these different marbles had been consol-
idated or made hard, then broken into fragments,
rolled and worn by attrition; and thus collected to-
gether, along with some sand or small siliceous bodies,
into

Earth.

65

The doc-
trine of fu-
sion applied
to the forma-
tion of the
strata.

67

Universal
prevalence
of the cal-
careous and
siliceous
strata.

62

Consolida-
tion of a
stratum
from a for-
tuitous col-
lection of
hard bodies.

63

Spanish
marble
described.

Earth.

64
Proof of
been in a
state of fu-
sion.

into one mass. Lastly, this compound body is consolidated in such a manner as to give the most distinct evidence that this had been executed by the heat of simple fusion.

"The proof is, that, besides the general conformation of those hard bodies, so as to be perfectly adapted to each other's shape, there is in some places a mutual indentation, which resembles perfectly the junction of the different bones of the cranium; and which must necessarily have required a mixture of those bodies while in a soft or fluid state.

"This appearance of indentation is by no means singular or limited to one particular specimen. I have several specimens of different marbles, in which fine examples of this species of mixture may be perceived. But in this particular case of the Spanish pudding-stone, where the mutual indentation is made between two pieces of hard stone worn round by attrition, the softening or fusion of these two bodies is not simply rendered probable, but demonstrated.

"Having thus proved, that those strata had been consolidated by simple fusion, as proposed, we now proceed to show, that this mineral operation had been not only general but universal, in consolidating our earth in all the various degrees, from loose and incoherent shells and sand to the most solid bodies of the siliceous and calcareous substances.

65
The same
doctrine
exemplified
in chalk.

"To exemplify this in the various collections and mixtures of sands, gravels, shells, and corals, were endless and superfluous. We shall only take for an example one simple homogeneous body, in order to exhibit it in the various degrees of consolidation, from the state of simple incoherent earth to that of the most solid marble. The substance meant is chalk, naturally a soft calcareous earth, but which may be found consolidated in every different degree.

66
Account of
a ridge of
indurated
chalk run-
ning thro'
the isle of
Wight.

"Through the middle of the isle of Wight there runs a ridge of hills of indurated chalk. This ridge runs from the isle of Wight directly west into Dorsetshire, and goes by Corfe Castle towards Dorchester, perhaps beyond that place. The sea has broke through this ridge at the west end of the isle of Wight, where columns of the indurated chalk remain, called the *Needles*; the same being found on the opposite shore in Dorsetshire. In this field of chalk we find every gradation of this soft earthy substance to the most consolidated body of this indurated ridge, which is not solid marble, but which has lost its chalky property, and acquired a kind of stony hardness.

67
Another in
Ireland.

"We have this cretaceous substance in its most indurated and consolidated state in the kingdom of Ireland, not far from the Giant's Causeway; and it affords the most perfect evidence of this body having been once a mass of chalk, which is now a body of solid marble. Thus, if it is by means of fusion that the strata of the earth have in many places been consolidated, we must conclude that all the degrees of consolidation, which are indefinite, have been brought about by the same means.

68
Granite al-
so consoli-
dated by
fusion.

"It may, however, still be alleged, that there is a great part of the solid mass of this earth not properly comprehended among those bodies which have been thus proved to be consolidated by means of fusion. This is granite; a mass which is not generally stratified, and which being a body perfectly solid, and

No 107.

forming some parts in the structure of this earth, deserves to be considered. The nature of the granite is too intricate a subject to be here considered; we shall therefore only now take notice of one species; and if this appears to have been once in a state of fusion, we must conclude that all the rest have been so too. The species in question comes from Portfoy, on the Description road to Huntley; and is partly a porphyry and partly of a granite. The singularity of it, however, consists not in the nature or proportions of its constituent parts, but in the uniformity of the sparry ground, and the regular shape of the quartz mixture. This siliceous substance, viewed in one direction, or longitudinally, may be considered as columnar, prismatical, or continued in lines running nearly parallel. These columnar bodies of quartz are beautifully impressed with a figure on the sides, where they are in contact with the spar. This figure is that of furrows or channels, which are perfectly parallel, and run across the longitudinal direction of the quartz. This striated figure is only seen when, by fracture, the quartz is separated from the contiguous spar. But what is more particularly to be noticed is, that the transverse section of those longitudinal bodies not only have separately the forms of certain topographical characters, but collectively give the regular linear appearance of types set in writing.

Earth.

69
from Port-
foy.

"It is evident from the inspection of this fossil, that the sparry and siliceous substances had been mixed together in a fluid state; and that the crystallization of the sparry substance, which had been rhombic, had determined the regular structure of the quartz, at least in some directions. Thus the siliceous substance is to be considered as included in the spar, and as figured according to the laws of crystallization proper to the sparry ground; but the spar is also to be found included in the quartz. Now it is not possible to conceive any other way in which these two substances, quartz and feldspar, could be thus concreted, except by congelation from a fluid state, in which they had been mixed."

Our author having at length finished his arguments on the formation of the strata, draws the following general conclusion. "If it be by means of heat and fusion that the strata have been consolidated, then, in proportion to the degree of consolidation they have undergone from their original state, they should, *ceteris paribus*, abound with more separations in their mass. But this conclusion is not found consistent with appearances. A stratum of sand-solidation, for instance, does not abound so much with cutters or veins as a similar stratum of marble, or even a similar stratum of sand-stone that is more consolidated. In proportion therefore as strata have been consolidated, they are in general intersected with veins and cutters; and in proportion as strata are deep in their perpendicular section, the veins are wide, and placed at greater distances. In like manner, when strata are thin, the veins are many, but proportionally narrow.

"It is thus upon chemical principles to be demonstrated, that all the solid strata of the globe have been posed of condensed by means of heat and hardened from a fluid state of fusion. But this proposition is equally to be maintained from propositions that are mechanical. The strata of the globe, besides being formed of earths, are composed of gravel, sand, and fragments of hard bodies;

70
Veins of
the strata
numerous
in propor-
tion to
their con-
solidation.

71
Strata com-
posed of the
fragments of
others.

Earth.

dies; all of which may be considered as in their nature simple: but these strata are also found composed of bodies which are not simple, but are fragments of former strata which had been consolidated, and afterwards were broken and worn by attrition so as to make gravel. Strata composed in this manner have been again consolidated; and now the question is, By what means?

"If strata composed of such various bodies had been consolidated, by any manner of concretion, from the fluidity of a dissolution, the hard and solid bodies must be found in their entire state, while the interfaces between those constituent parts of the stratum are filled up. No partial fracture can be conceived as introduced into the middle of a solid mass of hard matter without having been communicated from the surrounding parts. But such partial separations are found in the middle of those hard and solid masses; therefore this compound body must have been consolidated by other means than that of concretion from a state of solution."

"The Spanish marble already described, as well as many consolidated strata of siliceous gravel, afford the clearest evidence of this fact. These hard bodies are perfectly united together in forming the most solid masses; the contiguous parts of some of the rounded fragments are interlaced together, as has already been observed; and there are partial shrinkings of the mass forming veins traversing several fragments, but perfectly filled with the sparry substance of the mass, and sometimes with parts of the stone distinctly floating on the transparent body of the spar. Now there is not in nature any known power, besides heat and fusion, by which these effects might be produced. But such effects are general to all consolidated masses, although not always so well illustrated in a cabinet specimen."

Thus the formation of the strata is supposed to be fully discussed: where our author goes on to consider the means by which they have been elevated from the bottom of the ocean; for he looks upon it as an undoubted fact, that the highest points of our land have been for ages at the bottom of the ocean. "It is a truth unquestionable (says he), that what had been originally at the bottom of the sea, is at present the highest of our land. In explaining this appearance, therefore, no other alternative is left, but either to suppose strata elevated by the power of heat above the level of the present sea, or the surface of the ocean reduced many miles below the height at which it had subsided during the collection and induration of the land which we inhabit. Now if, on the one hand, we are to suppose no general power of subterraneous fire or heat, we leave to our theory no means for the retreat of the sea or the lowering of its surface. If, on the other, we are to allow the general power of subterraneous heat, we cannot have much difficulty in supposing either the surface of the sea to have subsided, or the bottom of the ocean in certain parts to have been raised by a subterranean power above the level of its surface, according as appearances shall be found to require the one or the other of these conclusions."

"The strata formed at the bottom of the ocean are necessarily horizontal in their position, or nearly so; and continuous in their horizontal direction and extent. They may change, and gradually assume the

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nature of each other so far as concerns the materials of which they are formed; but there cannot be any sudden change, fracture, or displacement naturally in the body of a stratum. But if these strata are cemented by the heat of fusion, and erected with an expansive force acting below, we may expect to find every species of fracture, dislocation, and contortion in those bodies, and every degree of departure from a horizontal towards a vertical position. The strata of the globe are actually found in every possible position: for found broken from horizontal, they are frequently found vertical; from continuous, they are broken and separated in every possible direction; and from a plane, they are bent and doubled. It is impossible they could have been formed by the known laws of nature in their present state and position. And here the apparent irregularity and disorder of the mineral regions are as instructive, with regard to what had been transacted in a former period of time, as the order and regularity of these same regions are conclusive in relation to the place in which a former state of things had produced that which, in its changed state, we now perceive."

"We are now to conclude, that the land on which we dwell had been elevated from a lower situation by the same agent which had been employed in consolidating the strata, in giving them stability, and preparing them for the purpose of the living world. This agent is matter actuated by extreme heat, and expanded with amazing force. If this has been the case, it will be reasonable to expect that some of the expanded matter might be found condensed in the bodies which have been heated by that igneous vapour, and that matter foreign to the strata may have been thus introduced into the fractures and separations of those indurated masses. We have but to open our eyes to be convinced of this truth. Look into the sources of our mineral treasures; ask the miner from whence has come the metal into his vein? Not from the earth or air above; not from the strata which the vein traverses. There is but one place from whence these minerals may have come; and that is, the bowels of the earth; the place of power and expansion; the place from whence matter have proceeded that intense heat by which loose materials have been consolidated into rocks, as well as that enormous force by which the regular strata have been broken and displaced."

Our author is of opinion, that this action of heat is likewise evident from an inspection of the materials with which the veins are filled, as well as their various fractures and irregularities; and informs us, that some great mechanical power must have been employed in filling these veins, as well as that necessarily employed the matter in making the first fracture and division. The successive eruptions of fluid substances into the veins, he says, is demonstrable from the mere inspection of the veins and their contents, it being very common to see successive three successive series of these operations; "all which may be perceived in a small fragment of a stone, which a man of science may examine in his closet, often better than by descending to the mine where all the examples are found on a large scale."

These fiery operations, he contends, are not to be accounted any way accidental, but as entirely natural to the globe, and remain at this day with undiminished force; and of this he brings a proof from the eruptions

Earth.

73
Strata
found broken and disjointed in every possible position.

76
Have been raised by the force of fire.

77
Proved from the inspection of mines.

78

A great mechanical power requisite to fill the great mechanical power must have been employed in filling these veins, as well as that necessarily employed the matter in making the first fracture and division. The successive eruptions of fluid substances into the veins, he

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79

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I i

tione

72
Could not be consolidated by a quick dissolution.

73
Must have undergone a fusion by fire.

74
How the strata have been elevated from the bottom of the ocean.

Earth.
80
Sicilian jasper
once in a
state of
fusion.
81
Heat of
volcanoes
the renova-
ting power
of the
earth.

tions of mount *Ætna*, informing us, that he has in his possession a table of Sicilian jasper, which evidently shows that this calcareous stone had flowed and been in such a state of fusion as lava is.

This subterranean heat manifested in the burning mountains is the renovating power which the earth possesses within itself, and which prevents it from coming to an end by reason of the perpetual waste taken notice of n° 22. "Volcanoes (says he) are natural to the globe as general operations; but we are not to consider nature as having a burning mountain for an end in her intention, or as a principal purpose in the general system of this world. The end of nature in placing an internal fire or power of heat, and a force of irresistible expansion in the body of this earth, is to consolidate the sediment collected at the bottom of the sea, and to form thereof a mass of permanent land above the level of the ocean, for the purpose of maintaining plants and animals. The power appointed for this purpose is, as on all other occasions where the operation is important, and where there is any danger of a shortcoming, wisely provided in abundance; and there are contrived means for disposing of the redundancy. These, in the present case, are our volcanoes.

"A volcano is not made on purpose to frighten superstitious people into fits of piety and devotion, nor to overwhelm devoted cities with destruction: A volcano should be considered as a spiracle to the subterranean furnace, in order to prevent the unnecessary elevation of land and fatal effects of earthquakes; and we may rest assured, that they in general wisely answer the end of their intention, without being in themselves an end for which nature had exerted such amazing power and contrivance."

The Doctor then goes on to shew, that volcanoes are not proper for elevating land, unless placed at the bottom of the sea, where the contact of the water tends to close the orifice, and to accumulate matter upon the weakest part. An instance of this was given in the year 1707, when the burning island arose in the Mediterranean; and he confirms his theory by the great number of melted matters which are every where to be found in the strata, even of countries where no volcanoes exist at present. Examples are brought from the dykes of whin-stone, as they are called in this country, and which he supposes to have been once in a state of fusion.

In order to avoid an objection which might here arise from the difference betwixt the appearance of our whinstone and the lavas of volcanoes, our author makes a distinction between such as have been erupted at the moment of explosion, and those which had been melted under a vast compression of weighty materials, and at last exposed to the air after the lapse of a number of ages. "In the erupted lavas, those substances which are subject to calcine and vitrify in our fires, suffer similar changes when delivered from a compression which had rendered them fixed, though in an extremely heated state. Thus a lava in which there is much calcareous spar, when it comes to be exposed to the atmosphere, or delivered from the compressing force of its confinement, effervesces by the explosion of its fixed air; the calcareous earth at the same time vitrifying with the other substances. Hence such violent ebullition in volcanoes, and hence the e-

mission of so much pumice stone and ashes which are of the same nature. In the body of our whinstone, on the contrary, there is no mark of calcination or vitrification. We frequently find in it much calcareous spar, or the *terra calcarea aerata*, which had been in a melted state by heat, and had been crystallized by congelation into a sparry form. This is the cause of the differences between the erupted lavas and our whinstone, toadstone, and the Swedish trap; which may be called *subterranean lavas*."

All this time our author seems to have excluded from his system every idea of accounting for the origin of metals; though this would seem to be no less necessary than to account for that of whinstone. At last, however, we are informed that there are peculiar productions in the mineral kingdom which are rare, as being found only in few places; and of these he enumerates the diamond of the east, the platina of the west, and the tin of Cornwall, Germany, and Sumatra. "But all these substances (gold itself not excepted)," says he, "are to be considered as the vapours of the mineral regions condensed occasionally in the crevices of the land."

The last part of our author's dissertation contains the system of decay and renovation observed in the earth. In this having again observed what had been already repeated over and over, that the land we see at present had been formed at the bottom of the sea, he proceeds to inform us, that, "at a gross computation, there may perhaps be a fourth part of our solid land which is composed from the matter that had belonged to these animals. Now what a multitude of living creatures, what a quantity of animal economy must have been required, for producing a body of calcareous matter which is interperfed throughout all the land of the globe, and which certainly forms a very considerable part of the mass! Therefore, in knowing how these animals had lived, or with what they had been fed, we shall have learned a most interesting part of the history of the earth; a part which it is necessary to have ascertained, in order to see the former operations of the globe, while preparing the materials of the present land."

Before entering upon this subject, however, he still thinks it necessary to consider some other of the sand, and component parts of the strata of our present earth. These are gravel, sand, and clay. Gravel, he tells us, is no other than stones worn round by their attrition in water; and finding them in the composition of our land, we must conclude, that in the former earth there had been operations of wind and water similar to those which we behold at present; and by which new gravel is continually prepared, as well as old gravel consumed or diminished by attrition upon our shores. Sand is no other than small particles of hard and solid bodies worn round by attrition. Clay is a mixture of different earths or hard substances in an impalpable state; and these substances are chiefly the siliceous and aluminous earths. Others are occasionally mixed in clays; or perhaps always to be found in some small portion. But the great quantity of siliceous, argillaceous, and other compound substances, in form of earth or other impalpable sediment, corresponds perfectly with that quantity of these same substances which must have been prepared in the formation of so much gravel.

Earth.
87
Composi-
tion of
a whin-stone
described.
83
Strange ac-
count of the
origin of
metals.

80
System of
decay and
renovation
in the
earth.
90
A fourth
part of the
land sup-
posed to
proceed
from ma-
rine ani-
mals.

91
Gravel,
sand, and
clay con-
sidered.

82
Volcanoes
to be con-
sidered as
spiracles to
the subter-
ranean
heat.

83
Are only
proper for
elevating
land from
the bottom
of the sea.

84
Whin-stone
supposed to
have been
in a state of
fusion.

85
Difference
between
erupted and
unrupted
lavas.

86
Ebullition
in volca-
noes owing
to the ex-
trication of
fixed air.

Earth.

Earth.

92
Conjectures concerning the former earth.

gravel and sand, by the attrition of these bodies in the moving waters.

From these considerations our author tells us, that we have reason to conclude there had been in the former earth such operation as we see at present; and likewise that it had been composed of similar materials. The animals which had formerly existed, also appear by their remains to have been similar to what they are now; and it is also probable that their food had been derived from the same origin, viz. vegetables. There must therefore have existed in the former earth a world of vegetables, as well as a world of animals and an ocean. The existence of these he determines from the many specimens of fossil wood and petrified plants to be met with; and its profusion he thinks is evidenced from the quantities of mineral coal: of which he says, that "nothing can be more certain than that all the coaly or bituminous strata have had their origin from the substance of vegetable bodies that grew upon the land."

93
C'est supposé to have been from wood.

94
Of the diminution of our present land.

Lastly, when he comes to speak of the actual diminution of the earth we at present inhabit, he proceeds in the following manner: "Our land has two extremities; the tops of the mountains on one hand, and the sea-shore on the other. It is the intermediate space between these two that form the habitation of plants and animals. While there is a sea, shore, and a high ground, there is that which is required in the system of the world; take these away, and there would remain an aqueous globe, in which the world would perish. But, in the natural operations of the world, the land is perishing continually; and this is what we now want to understand.

"Upon the one extremity of our land there is no increase, nor any occasion of mineral substance. That place is the mountain top, on which nothing is observed but continual decay. The fragments of the mountain are removed in a gradual succession from the highest station to the lowest. Being arrived at the shore, and having entered the dominion of the waves in which they find perpetual agitation, these hard fragments, which had eluded the resolving powers natural to the surface of the earth, are incapable of resisting the powers here employed for the destruction of the land. By the attrition of one hard body upon another, the moving stones and rocky shores are mutually impaired; and that solid mass, which of itself had potential stability against the violence of the waves, affords the instruments of its own destruction, and thus gives occasion to its actual instability."

95
No perceptible progress made in the dissolution of this earth.

Having thus described very particularly the means by which the destruction of the present earth is going on, it is natural to inquire what progress has been made in the work. But in this neither ancient nor modern history give any assistance. The trait between Italy and Sicily he confesses to be no wider; the isthmus of Corinth to be no narrower; nor the rock on which the famous tower of Pharos was erected, either larger or smaller than before. The Palus Mæotis in the time of Polybius appeared to be very near filling up, as that historian informs us; and so it continues to appear at this day, without any apparent progress having been made in it. In short, the whole of our author's researches can produce nothing more than the loss of a small island in the mouth of the harbour

of New Carthage, which, Polybius says, existed in his time; and for which there is now only a rock under water. Our author therefore is obliged at last to own, that the quantity of decay in the rocks he speaks of, has either been too small for human observation, or, which is more probable, that no accurate measurement of the subject by which this quantity of decrease might be ascertained had been taken and recorded. "To sum up the argument, therefore (says he), we are certain, that all the coasts of the present continents are wasted by the sea, and constantly wearing away upon the whole; but this operation is so extremely slow, that we cannot find a measure of the quantity in order to form an estimate. Therefore the present continents of the earth, which we consider as in a state of perfection, would, in the natural operations of the globe, require a space indefinite for their destruction. But in order to produce the present continents, the destruction of a former vegetable world was necessary; and consequently the production of our present continents must have required a time which is indefinite. In like manner, if the former continents were of the same nature with the present, it must have required another space of time, which is also indefinite, before they had come to their perfection as a vegetable world.

96
Immense space of time required for the destruction and reproduction of the dry land.

"It is necessary, however, that the present land should be worn away and wasted exactly in proportion as new land shall appear; or conversely, that an equal proportion of new land should always be produced as the old is made to disappear. It is only required, that at all times there should be a just proportion of land and water upon the surface of the globe, for the purpose of a habitable world. Neither is it required, in the actual system of this earth, that every part of the land should be dissolved in its structure, and worn away by attrition, so as to be floated in the sea. Parts of the land may often sink in a body below the level of the sea, and parts again may be restored, without waiting for the general circulation of land and water; which proceeds with all the certainty of nature, but which advances with an imperceptible progression. Many such apparent irregularities may appear without the least infringement on the general system. That system is comprehended in the preparation of future land at the bottom of the ocean, from those materials which the dissolution and attrition of the present land may have provided, and from those which the natural operations of the sea afford.

97
Of the manner of their dissolution and production.

"We have been now supposing, that the beginning of our present earth had been laid in the bottom of the ocean at the completion of the former land; but this was only for the sake of distinctness. The just view is this, that when the former land of this globe had been complete, so as to begin to waste and be impaired by the encroachment of the sea, the present land began to appear above the surface of the ocean. In this manner we suppose a due proportion of land and water to be always preserved upon the surface of the globe for the purpose of a habitable world, such as we possess. We thus also allow time and opportunity for the translation of animals and plants to occupy the earth. But if the earth on which we live began to appear on the ocean at the time when the last began to be resolved, it could not be from the ma-

Earth.

98
Present
earth con-
structed
from the
materials of
the third
before it.

terials of the continent immediately preceding this which we examine, that the present earth had been constructed : for the bottom of the ocean must have been filled with materials before land could be made to appear above its surface.—Let us suppose, that the continent which is to succeed our land is at present beginning to appear above the water in the middle of the Pacific Ocean ; it must be evident, that the materials of this great body, which is formed, and ready to be brought forth, must have been collected from the destruction of an earth which does not now appear. Consequently in this true statement of the case, there is necessarily required the destruction of an animal and vegetable earth prior to the former land ; and the materials of that earth which is first in our account, must have been collected at the bottom of the ocean, and begun to be concocted for the production of the present earth, when the land immediately preceding the present had arrived at its full perfection. This, however, alters nothing with regard to the nature of those operations of the globe ; the system is still the same. It only protracts the indefinite space of time in its existence, while it gives us a view of another distinct period of the living world ; that is to say, the world which we inhabit is composed of the materials, not of that which was the immediate predecessor of the present, but of the earth which, in ascending from the present, we consider as the third, and which had preceded the land that was above the surface of the sea while our present land was yet beneath the water of the ocean. Here are three distinct successive periods of existence ; and each of them is, in our measurement of time, a thing of indefinite duration. We have now got to the end of our reasoning ; we have no data further to conclude immediately from that which actually is ; but we have got enough. If the succession of worlds is established in the system of nature, it is in vain to look for any thing higher in the origin of the earth. The result therefore of our present inquiry is, that we find no vestige of a beginning, no prospect of an end."

99
Eternity of
the world
the final
result of
this theory.

100
White-
hurst's the-
ory.

VI. Though the theory of which we have now given such a large abstract is the most laboured and complete that hath yet appeared, it is still necessary to take notice of some other attempts, though perhaps less calculated to draw the attention of the public than that of Dr Hutton. One of these is by Mr Whitehurst ; of which the following is the most material part of an abstract given by himself at the end of his work.

101
The globe
originally
in a fluid
state.

"1. The globe we now inhabit was originally in a state of fluidity ; and that not owing to any dissolvent principle or subsequent solution, but to the first assemblage of its component parts. Whence it is presumed, that the earth had a beginning, and has not existed from eternity, as some have imagined ; though the precise number of ages it has existed have not yet been actually determined."

102
Proved
from its
spheroidal
figure.

The proof given by our author of this original fluidity of the earth rests entirely upon its oblate spheroidal form ; which a fluid globe may easily be supposed to assume, though we cannot conceive how a solid one should do so.

103
Its parts
blended to-
gether into
a soft pulp.

2. "The fluidity of the earth, and the infinite divisibility of matter, evidently show, that the component parts of air, earth, water, &c. were uniformly

blended together, none being heavier or lighter than another ; whereby they composed an uniform mass or pulp, of equal confidence in every part, from its surface to its centre : consequently the new formed globe was unfit for animal or vegetable life ; and therefore it would seem extremely absurd to suppose that either the one or the other were created during the chaotic state of the earth, or prior to its being formed into an habitable world : therefore the presumption is great, that mankind were not created till the earth was become suitable to the nature of their existence."

The proof of this position is laid down in the following manner. "It is a truth universally known, that the component parts of the most dense bodies become suspended in whatever menstrua they are dissolved ; as for instance, the particles of gold in aqua-regia, silver in aquafortis, salts in water, and water in air. Nay, we may likewise add, that the component parts of mercury, in the act of distillation, become suspended in air, notwithstanding the specific gravity of the former is to that of the latter as 11,000 to 1 nearly. Such, therefore, are the consequences arising from the infinite divisibility of matter, none being heavier or lighter than another when thus reduced to their original elementary principles."

3. "The component parts of the chaos were heterogeneous, or endowed with peculiar laws of *elusive attraction* ; whereby similar bodies are disposed to unite and form select bodies of various denominations, as air, water, earth, &c. : by means of these principles the chaos was progressively formed into an habitable world.

"But the first operation which presents itself to our consideration is the oblate spheroidal figure of the earth, acquired from its diurnal rotation, and the laws of gravity, fluidity, and centrifugal force ; which was no sooner completed, than the component parts began to act more freely, according to their affinities : hence the particles of air united to those of air, those of water to water, and those of earth to earth ; and with their union commenced their specific gravities, and destroyed that uniform suspension which had hitherto prevailed throughout the chaotic mass. Thus commenced the separation of the component parts ; for those of the greatest density began their approach toward the centre of gravity ; and those of the greatest levity ascended towards the surface : therefore, as air is nearly 800 times lighter than water, the presumption is great, that the former was sooner freed from the general mass than the latter, and formed a kind of muddy impure atmosphere, surrounding the newly formed globe. Water, being next in levity, succeeded the air, and universally encompassed the earth in one vast ocean. In process of time these elements became perfectly pure and fit for animal life.

4. "The component parts of the chaos being thus progressively separated and formed into select bodies, formed by the following consequences necessarily ensued ; namely, as the sun and moon were coeval with the chaos, the solids could not uniformly subside from every part of the surface, and become equally covered by water ; for as the separation of the solids and fluids increased, so, in like manner, the tides increased, and removed the former from place to place without any order or regularity. Hence the sea became unequally deep ; and these inequalities daily increasing, in process of time dry land appeared, and divided the waters which had hitherto

Earth.

104
Prove! from the solution of metals in acids, &c.

105
Parts of the chaos endowed with various attractions.

106
How the separation of its component parts took place.

107
Islands formed by the attraction of the sun and moon.

Earth. hitherto prevailed universally over the earth. The primitive islands being thus formed, in process of time became firm and dry, and fit for the reception of the animal and vegetable kingdoms.

108 Several days must have elapsed before the sun became visible. 5. "Such appears to have been the natural order and progression of these things; consequently, as the sun was coeval with the earth, several days and nights must have preceded the sun's first appearance in the heavens, or its becoming visible on the fourth day, according to the scripture account.

109 Order in which terrestrial bodies were created. 6. "The atmosphere, sea, and land, being thus formed for the reception of the animal and vegetable kingdoms in successive periods of time, we have now to consider the order in which they were severally created. First, since it appears that the ocean became perfectly pure and fit for animal life before the primitive islands were formed, therefore we have endeavoured to prove from a series of undeniable facts (A), that marine animals were first formed; and being extremely prolific, they increased and multiplied so exceedingly as to replenish the sea from pole to pole. 'The ocean being thus stocked with inhabitants prior to the formation of the primitive islands, many of them became enveloped and buried in the mud by the continual action of the tides; particularly all the species of shell-fish, which are least able to defend themselves from such interments. Therefore, since the remains of marine animals are imbedded at various depths in the earth, from one to that of several thousand feet, and this in all parts of the world hitherto explored, they bear sufficient testimony, that these marine bodies were thus entombed at successive periods of time; and likewise that they were created prior to the primitive islands, and consequently prior to any terrestrial animals. It may be needless further to observe, that these beds of marine shells plainly evince, that they were generated, lived, and died in the very beds wherein they are found, and were not brought from distant regions by a flood or floods of water, as some people have supposed; consequently such beds were originally the bottom of the ocean.

110 Marine animals first formed.

111 Have been buried in the earth at successive periods of time. 7. With regard to the mountains, and indeed the continents also, Mr Whitehurst is of opinion, that they are the effects of subterraneous fire. His sentiments on this subject, however, are something singular; for he tells us, that "mountains and continents were not primary productions of nature, but of a very distant period of time from the creation of the world, when the strata had acquired their greatest degree of firmness and cohesion, and the testaceous matter had assumed a stony hardness."

112 Mountains and continents formed by subterraneous fire. 113 Theories of Burnet, &c. insufficient. Thus we have given a very particular account of all the theories of any note concerning the formation of the earth which have yet made their appearance. The deficiency of those of Burnet, Woodward, Whiston, and Buffon, must be exceedingly obvious even to the most superficial reader. They all assume only the powers of attraction and repulsion as agents; without considering that these two powers, or indeed any other two with which we are acquainted, could only have composed matters nearly similar to each other. If the original particles of matter are homogeneous, and en-

114 Powers of attraction and repulsion insufficient.

dowed with similar powers, all the matter we see ought to be homogeneous also. But this is far from being the case. Some parts of it we see are exceedingly hard, others proportionably soft. The parts of some bodies attract each other violently; those of others have hardly any attraction for each other, but are separable by the smallest force. And though it should be granted that the powers of attraction and repulsion were originally different in different parts of matter, we have still to explain by what means the similar parts of matter found out each other in such a chaos as the earth originally was. 'This seems an insuperable difficulty in the systems of Drs Burnet and Woodward; and is equally, though less conspicuously so, in those of Whiston and Buffon.

Mr Whiston's system has another and very remarkable defect. He supposes the earth to have been originally a comet, and at a certain time to have become a planet: but he forgets to tell us by what means this comet was originally formed, or what kind of bodies the comets are. Yet certainly this theory of the comet was as necessary to his system as the theory of the earth itself: for all the substances now existing on the earth must originally have existed in the comet; and if the natural powers were known which made a distinction between one substance and another in the comet, we would also know those which distinguished terrestrial substances from one another. But though even this great deficiency should be overlooked, the supposition of a chaos or original confusion of any kind involves us in the greatest difficulties. If the whole surface of the earth consisted of a chaos of melted matter, we cannot reasonably think it would have appeared otherwise when cool than the lavas of burning mountains do just now; and this is a consequence of his system which Mr Whiston seems to have entirely overlooked.

115 Deficiency of Mr Whiston's theory. 116 Mr Buffon's theory is liable to the same difficulties of Mr Buffon's. with the rest. He places his chaos in the sun; and therefore ought to have given a theory of the sun before he gave one of the earth. It ought also to have been shown for what purpose the sun was created when he had nothing to shine upon, or what probability there is that comets existed when there were no planets. His account of the formation of the planets by the stroke of a comet, is just within the verge of possibility; but his account of the formation of mountains by the motion of the winds and tides, is certainly inconsistent with the common principles of mechanics. Though it should be granted, that water can dissolve every terrestrial substance when vitrified by a heat 10,000 times greater than our hottest furnaces, as the sun must necessarily be; and though the water should let fall this matter as a sediment in what quantities and forms we think proper to imagine; it is impossible any of it could be thrown two or three miles above the surface of the water, in order to form those high mountains which are to be met with in different parts of the world. It is indeed very plain, that though by the motion of the waters their sediment might be collected in great heaps, it could never reach higher than their surface. The mountain,

(A) These proofs are afterwards considered, as here our author seems to be of the same opinion with Dr Hutton.

Earth.

mountain, once formed, must then be for ever covered with water; for the sediment would take up precisely the same bulk when a mountain that it did when in a state of dissolution, and the water could never retire from it as he supposes. If the waters retired into vast subterraneous caverns, according to another of Mr Buffon's suppositions, they must have remained for ever in these caverns, from whence they could not have returned to effect those wonderful changes he ascribes to them. But what in the strongest manner shows the fallacy of Mr Buffon's hypothesis, is the analogy he draws between mountains on dry land and islands in the sea. The islands, he says, are only the tops of great mountains in the ocean. If, therefore, the ocean had for a series of many ages covered the present habitable part of the world, as our author supposes, we should undoubtedly find many mountains upon the dry land, the tops of which had formerly been islands. But no such thing is to be found. There is not on earth a mountain with a top broad and flat like the island of Great Britain or Ireland, or even like islands of much less consideration.

These, and many other objections that will naturally occur to an attentive reader, show the extreme difficulties under which the hypothesis of Mr Buffon labours, as well as others. These difficulties arise, in the first place, from their assuming too few natural powers. Though it is certain that the powers of attraction and repulsion exist in nature, it is no less certain that there are many others. One very remarkable power entirely different from those of attraction and repulsion, may be called the power of *assimilation* or *transmutation*. By this, each animal, and each plant, changes the nutritious particles thrown into its stomach, or which it meets with in the earth, into a substance of its own peculiar kind. Thus, a stalk of wheat, by means of its roots, always assimilates the nutritious particles of the ground into that particular grain we call wheat, and no other. This power naturalists have not been able to explain on the principles of attraction and repulsion, or any others with which we are acquainted; and therefore it may justly be called one of the primary laws of this earth at least, whether we understand the manner in which it operates or not.—Another power which seems to be diffused throughout this terraqueous globe, and common to all substances, water alone excepted, is that of multiplying themselves, or producing others of the same species. With regard to plants and animals, this is exceedingly evident; but may be disputed in the case of minerals. It is certain, however, that mines which have been exhausted, will in time be again replenished with ore; that spars and crystals, if broken or cut while their connection with the earth remains, will protrude a substance similar to the rest, as certainly as the wounded body of an animal will protrude flesh of a kind similar to what was taken away. The earth itself is capable of this multiplication. We see how it hath a tendency to ascend, and cover stones, &c. which lie a long time on its surface; and thus does this element, seemingly the most sluggish of all others, swallow up every thing that lies for some time undisturbed upon it. Hence we now meet with many monuments of antiquity below ground, which formerly were undoubtedly above it. Yet we have no right from thence to conclude, that the height of the

117
A number of natural powers besides attraction and repulsion proved to exist.

dry land above the water was greater at that time than what it is now. This multiplication of earth is chiefly owing to vegetation; which continually produces a new crust on the top, and thus tends to bury all such matters as rest upon the surface. This crust, however, does not produce a continual increase in the height of the dry land; for whatever quantity the vegetables add to the surface, they take from the under parts by the suction of their roots. Thus the ground becomes more porous, and the weight of ancient buildings, stones, &c. gradually forcing them downwards, they are at last buried under ground to a considerable depth.—Hence it is easy to account for the sinking of the marine bodies that are to be found at different depths in the earth, even supposing them to have been left on shells at its surface by the deluge. M. Buffon's objection, drawn from the great quantities of them, seems but very weak: for it is certain, that marine animals, both of the crustaceous and other kinds, are found in the sea at this day in amazing quantities; and there is no bed of shells so large, that we can reasonably think it impossible for all the animals to have existed in it at once.

118
Appearance of shells at great depths accounted for.

With regard to the strata, it seems undeniable that they may be produced from natural causes. Clay will sometimes be consolidated into stone; flint, marble, and limestone, are all found to grow naturally in the earth; so that we cannot draw any conclusion from the order in which we now find them. Though we find a bed of shells, then, in the heart of a solid rock, this makes no difficulty in the theory of the earth; since we know that the rock hath by some natural cause been consolidated around them. In fact, this is not so wonderful, as what is related by Mr Price in his Treatise of Minerals, Mines, &c. viz. That at the town of Redruth in Cornwall, "some labourers being put to clear and level the street for a pavement, they found a piece of hard stone in the ground, with abundance of common small pins of brass interspersed in and throughout the stone, in such manner and form, that all those who saw it afterwards were convinced it was not done artificially, but that the stone was formed and produced by petrification, subsequent to the time the pins were dropped into the ground. Doctor Plot, in his Natural History of Staffordshire, says, that near Newcastle under Lyne, there was found a stone with a man's skull, teeth and all, inclosed in it."—From these and other facts in some measure similar, this author concludes, that every earth or clay, in some places, may be converted into stone in process of time, at such a depth where it is undisturbed by being never lacerated nor molested, and also where it abounds with an uncommon quantity of juices of a lapidescent quality: but this property being attenuated or destroyed, the earthy stones may not improbably again return to their primitive clay. Thus we see some sorts of stone, when dug out of the ground and exposed to the air for a considerable time, do moulder again into earth, at least in appearance; while others, of an earth-like quality, are indurated, and become more compact and durable by lying above ground."

119
Changes may naturally happen in the strata of the earth.

The theory laid down by Dr Hutton is of a different nature from the rest; and as it has been supposed to be directly to militate against revelation, merits a very particular consideration. The expression, however, which

120
Dr Hutton's theory considered.

Earth.

which he concludes his dissertation, that "we can find no vestige of a beginning—no prospect of an end," might be supposed to relate only to the deficiency of our understandings or mode of inquiry, had he throughout the whole course of his work given a single hint of any materials from which the world was originally formed. In this he differs most essentially from the other theorists whom we have mentioned; for all of them suppose a chaos to have been originally created, from whence all the variety of substances we see at present have been formed. But as the Doctor makes no mention of any thing prior to a world nearly similar to what we see just now, we must necessarily conclude that its eternity is a part of his creed. Now, that the world has not been eternal, may be proved from what he himself allows. Wherever we perceive a succession, we know that there must of necessity have been a beginning; but, according to our author, there has been a succession of worlds, by a kind of uncouth generation, similar to what would happen to the human race if a man was to descend immediately from his grandmother. Proceeding in this way, therefore, we must at last arrive at one great-grandmother of earths, from whence all the rest were descended; and of this one a theory was no less necessary than of any of her successors. This theory would have been the more difficult, as his great element *cockle-shells* and *oysters* would then have been absent, and the materials from whence they were afterwards to be produced must have been sought for.

121
Arguments
against the
eternity of
the world

122
From the
succession
of worlds
supposed by
Dr Hutton.

123
A superna-
tural power
necessary in
the formation
of the
world.

124
Shown
from the
production
of animals
and vegeta-
bles.

125
Quantity of
shells found
on earth
too small
on the Doc-
tor's prin-
ciples.

§ See n^o 90.
126
Amazing
increase of
shell-fish.

Another argument, which evidently shows not only that the world is not eternal, but that some other power besides its own interfered with it originally, may be taken from the existence of animals and vegetables; both of which our author allows to have had a place throughout all his worlds. We see at present, that animals proceed from animals, and vegetables from vegetables; but the time must have been, when an animal was produced without a parent, and a vegetable without a seed. At this time the world must have been influenced by a power different from any it possesses at present; for no such power is now to be found in any part of the globe.

Lastly, the quantity of shells, great as it is, can by no means be reconciled with an eternal succession of worlds, or even with three; for, according to him, we must have three in order to have *two* habitable ones; viz. one lying at the bottom of the sea, another wearing away, and another beginning to emerge. Now he informs us, that only a fourth part of our land is composed of calcareous matter derived from marine animals*. But if one of the worlds has continued for a time *indefinite*, and consequently another lain at the bottom of the sea for an equal length of time, it must, instead of having a fourth part of its soil composed of calcareous matter at the time of its emergence, have been entirely composed of it, at least if we can credit what is said concerning the prolific nature of these animals. Mr Whitehurst informs us, that "it is not uncommon to take away a bed of shell-fish several fathoms in thickness; and though the places where they are fished for appear to be entirely exhausted, yet in the ensuing year there shall be as many found in all these places as before." Such an amazing increase must, in a time *indefinite*, especially if repeated for an indefinite number of times, have reduced the whole

127

A superna-
tural power
must have
taken place
in the origi-
nal forma-
tion of
vegetable

teraqueous globe to an heap of cockle-shells or other substances of that kind.

Our author is equally unfortunate in the very first step of his argument, where he says that the soil is only "the materials collected from the destruction of the solid land." He owns that all his earths produced vegetables; but these must have had a soil whereon to grow before the first world had time to be destroyed. We are therefore here in the same dilemma with regard to the soil that we were before with regard to the vegetables; and as we are obliged to own the interference of a Superior power to produce the first vegetable, so must we also have recourse to the same power for the production of the soil on which it grew. All these considerations ought to have led the Doctor to a conclusion very different from that which he has drawn, and to have showed him that the *beginning* of the world was occasioned by a power which cannot possibly be investigated, because it lies without the bounds of Nature itself, and far beyond the reach of our faculties.

128

Origin of
the earth
cannot be
accounted
for from
natural
causes.

This objection indeed militates invincibly against all theories of the earth which seek to derive its original from natural causes. The powers of attraction and repulsion we have already shown to be insufficient; and though we should add to them those of fire and water, with all the train of solvents and precipitants which chemistry can afford, the deficiency will still be as great. It is true, that by means of chemistry we can imitate many of the natural operations, provided we have the proper materials; But this is the capital defect in all our theories of the earth. Whence came vast quantities of argillaceous earth into one place, of siliceous earth into another, of the materials for iron, silver, gold, &c. into the places where they are now found? With Dr Hutton indeed the whole seems to be composed of two materials, viz. calcareous earth and flint. But before he could justify this assertion, he ought to have produced from these two materials, and at least a great number of the different substances with which the earth is replenished. But instead of this, he has recourse to natural productions, formed, as he says, by means which, in the hands of the best chemists, will prove insufficient to produce any thing like them.

129

Too much
attributed
to calcare-
ous earth
and flint by
Dr Hutton.

In his account of the origin of calcareous matter, he tells us, it is to be derived entirely from the shells of marine animals; but he forgets to inform us whence these animals got their shells. There must have been of course some source of calcareous matter from which the *first* animal (for we have already seen that they could not have existed from eternity) derived its shell, and that independent of any other marine animal. Now we see at this day an abundant source from whence the shells of all marine animals may be derived, viz. the waters of the ocean, which contain a great quantity of calcareous matter. If we inquire whence these waters have it, we may say they take it up from the earth, part with it again in the form of shells, corals, &c. redissolve it, and so on. But if we will still inquire farther whence the earth itself had it, we must once more have recourse to that unsearchable and supernatural power to which we ascribed the origin of animals, vegetables, and the soil whereon they grow.

130

Calcareous
matter pro-
ved to exist
independ-
ent of ma-
rine ani-
mals.

It is the foundation of Dr Hutton's theory, and in-
deed.

Earth.
131
Earth proved not to have remained long at the bottom of the sea.

deed seems now to be a favourite doctrine of most theorists, that the earth we inhabit has once been at the bottom of the sea; and it is thought to be a sufficient proof of this, that such vast quantities of marine shells are to be met with on dry land. Mr Whitehurst, after giving a long account of these shells, infers, among other things, that the "beds of fossil shells, which consist of one species only, and are not natives of the climate where found, but of very distant regions of the earth, evidently show that they were generated, and have lived and died in the very beds where found; and could not have been removed from their native climates by a flood or floods of water, with so much order as to form beds consisting only of one select species; and therefore all such beds must have been originally the bottom of the ocean."

132
False mode of reasoning adopted by many theorists.

On this mode of reasoning, however, we must observe, that no hypothesis can have a worse foundation than when it is built confidently on our own ignorance. We know not, for instance, how a bed of fossil shells came into a certain place; therefore the whole world has been at the bottom of the sea for many thousand years, the climates have changed, or it has been eternal! Thus to unhinge the settled laws of nature for such trivial purposes, is certainly the greatest contradiction to true reasoning that can be imagined. But it is not only from a negative argument of this kind that we may refute this hypothesis; there is a much stronger one drawn from the marine productions themselves. It is certain, that there are substances very different from shells of any kind, which grow up from the bottom of the ocean, and in time *indefinite* ascend all the way to the surface, and there form islands. These are the coral rocks so common and so dangerous in the South Sea, and of which many of the islands there are formed. Now, how comes it to pass, that among all the marine monuments to be found on land we find no coral rocks growing there? The answer to this is obvious. The coral rocks require a vast length of time for their production, and are strongly fixed to the place where they grow; they cannot therefore be removed over land by any sudden flood or inundation, not even by a general deluge. Though it appears therefore, from the shells and other marine moveables, that what is now dry land has once been at the bottom of the sea, yet it is equally evident from the deficiency of these rocks, that it has not remained so for any length of time; and therefore, though we should by no means be able to explain all the appearances of fossil shells, we are not to admit a supposition which, from the circumstance just mentioned, cannot possibly be true.

134
Why every appearance of fossil shells cannot be explained.

With regard to these shells, however, we must remark, that it is in vain to attempt the explanation of every appearance; nor can any such thing be reasonably desired, even though we should acknowledge the deluge to be the universal cause. We know not, nor can we have any conception of, what might be accomplished by the mere mechanical motion of the waters in this case. Every one who has had an opportunity of seeing the effects of a violent land-flood, will be ready to own that it has performed things which *a priori* he would not have thought it could have done. But how infinitely must these effects be exceeded by one vast deluge, in which not only the dry land was soft-

ed by an incessant rain of six weeks, but the sea rose on all sides, and poured in upon it with all the moveable contents which the waters carried along with them?

That great numbers of shells already formed would be brought along with the waters of the ocean, is an assertion which can scarce be denied; and we shall be inclined to look upon this number as exceedingly great, if we consider the way in which it is most probable that the deluge came on. This was by the issuing out of waters* from every pore of the earth and bottom of the ocean, as well as by their descent from the clouds. In consequence of the former action, all the light bodies at the bottom of the sea must have been turned topsy turvy, and carried up no one can tell how far; at the same time that by the progressive motion of the waters they were carried to an unknown length over the land, and there deposited when the motion ceased.

This circumstance of itself will account for the appearance of vast numbers of shells and other marine would leave productions on land; but there is another which must be taken along with it, and will undoubtedly add greatly to its force. The unsathomable depths of the ocean are not the proper habitations of fish; and they are only found on shoals, or near the sea-coasts. At the time of the deluge, therefore, great numbers of the marine animals must have exchanged their ancient habitations for those where the water was more shallow; and of consequence would have abounded on the tops of mountains and other elevated places. Whether those animals whose exuvæ are most plentifully met with on land have any locomotive power when full-grown, is uncertain; but whether they have or not, they are certainly of such minute sizes when young, that they may be floated to any distance by water. Thus therefore any kind of shell-fish may have reached any place in the globe; and Mr Whitehurst of himself owns, that they can arrive to their full maturity in less than a year, as the beds which have been exhausted one year are found to be replenished the next. Now the flood, according to the Scripture account, continued long enough to allow time for their increase from spawn to their full size. It arrived at its full height in 40 days; and continued stationary for five months. It then began to decrease; but so gradually, that it was not till the first day of the tenth month that the tops of the mountains began to appear above the surface of the water; and it was not till towards the end of the eleventh that the tops of trees began to emerge. Here then we have time for beds of shell-fish to grow, live, and afterwards be left by the water; which in their mature state they could not follow, and thus to die in the places where they were generated.

133
The continuance of the flood allowed time for shell-fish to breed on land.

Thus far we may safely argue with regard to the existence of large beds of shells on the surface of the earth: and it has already been shown how the earth would naturally cover and swallow them up to a considerable depth. But to account for the great depths at which we find them sometimes buried, several other things must be taken into consideration. One is, that would be the earth, by the continual rains at the time of the deluge, as well as by the issuing of the waters every where through its substance, must have been exceedingly soft and easily penetrated. The helpless animals, of the earth, therefore,

135
Of the effects which the deluge certainly produced.

139
Numbers

Numbers of shells sunk deep into the earth by the pressure of the waters.

Earth.

therefore, brought along with the ocean at its first irruption over land, would have been deep buried in the mud: and when we take into our account the pressure of a column of water four miles deep, it is impossible to say what effects this cause might have produced. They might, besides, have been accumulated in clefts of rocks, in hollows, valleys, and caves; and have been there consolidated by petrification and the growth of calcareous matter over them. And that something similar to this actually happens, we are very certain: for Mr Whitehurst informs us, that "the springs of Matlock-bath in Derbyshire, though extremely pellucid and friendly to the human constitution, are nevertheless plentifully saturated with calcareous matter, which readily adheres to vegetables and other substances immersed in their streams; and thus, by a constant accretion, large masses of stone are gradually formed. The banks on which the bath-houses stand, and likewise the buildings themselves, are mostly composed of such materials."—Now, had these waters directed their course over a bed of shells, through a burying-place, or over a field of battle, it is evident that they would have inclosed a great number of shells, human and horse bones, heads of lances, swords, or even the more modern weapons of guns and pistols; which, to a curious naturalist, might have furnished an argument for the antiquity of these latter weapons. If therefore we see that bodies at this day may be so easily imbedded in stone, why should we pretend to set bounds to the petrifications which may have happened in the course of more than 4000 years? a period far beyond the reach of our most ancient histories.

It is not meant, by what we have just now said, to explain all the appearances of fossil shells or bones from the deluge as a general cause. This cannot be done unless we knew all the circumstances. The following facts, however, may be looked upon as authentic. 1. That when the waters overwhelmed the land, great numbers of marine animals were carried along with it. 2. That during its continuance most of those which have any locomotive power would choose rather to dwell over land than in places which had formerly been their residence. 3. That while the waters remained on the earth, all kinds of marine animals would breed over land in their natural way; and such as could not follow the waters in their retreat, would be left to die on dry land, which must have been the case particularly with shell-fish. 4. These impotent animals, which have little or no power of locomotion, would by the pressure of a column of water four miles high be buried to depths unknown. 5. After the retreat of the waters, those which had been lodged in hollows or clefts, or perhaps diffused through the substance of many soft strata, might by some petrifying quality in the stratum be so consolidated along with it, as afterwards to form one entire rock. This is evident, not only from the example of the Matlock-springs, but more so from that of the pins found in the stone at Red-Ruth in Cornwall, from the petrified skull mentioned by Dr Plott, and many others; of which we shall mention the following from Mr Whitehurst.—"The strata of limestone in Derbyshire, and in many other parts of England, abound with the exuvie of marine animals, or the impressions of them in the solid

substance of the stone; and we have likewise several instances related by authors of the bones of terrestrial animals, and also of wood, having been found enveloped in strata of stone. A complete human skeleton, with British beads, chains, iron-rings, brass bits of bridles, were dug up in a stone-quarry near the Earl of Widdrington's seat at Blanknay in Lincolnshire.—Human bones and armour, with Roman coin, fibula, &c. were found in a stone-pit in the park at Hulfanton in Norfolk, supposed to have been buried after a battle.—In the mountains of Canne, half a league from Mea-strick, were found the remains of a crocodile well preserved in a stratum of sand-stone.—The remains of a crocodile were also found in a stratum of stone at Blenheim.—The beds of argillaceous stone, &c. incumbent on coal, also contain a great variety of figured fossils representing different parts of the vegetable creation."

From all these examples it is plain, that the lapidescent power which the earth possesses is capable of encompassing bodies with stone to an unknown thickness. In whatever situation therefore we find those fossil bodies, we have no reason to say that the deluge is not ultimately the cause of their being there; because its power in overspreading the earth with them, in burying them in it, or forcing them into clefts and caverns, is altogether unknown; and before it is denied that the deluge could be the cause of such appearances, it is necessary to show all that it really *could* do, which is evidently impossible; so that here our speculations must ultimately rest.

We shall only add one other fact which must certainly have taken place at the deluge. At that time the world is generally thought to have been very full of inhabitants. These, as well as all the inferior animals, would naturally fly from the approaching danger. This would assemble them in great numbers in such places as appeared to afford security; and here they would all perish together. This will account for the vast heaps of bones found in certain parts of the world, as in the rock of Gibraltar, Dalmatia, &c. and the natural petrificative power of the earth may account for their consolidation. The slaughters which mankind have made of one another may indeed account for many of these appearances. When we read in history of 40,000, 50,000, or 100,000 men being killed in a battle, we never think of the space their bones would occupy when thrown into a heap; nevertheless, we are assured that the bulk of these remains must be very great. Tamerlane, with an army of 800,000 men, filled up the harbour of Smyrna by causing each of his soldiers throw one stone into it; and when Marius defeated the Cimbri, the bones of the slain were so numerous, that they were used for a long time as fences for vineyards. Had these been collected into one heap, and afterwards consolidated by petrificative matter, they would undoubtedly have occupied a very considerable space. What then must have been the case, when every man, nay every other terrestrial creature, died at once? Taking all these things into consideration, it must surprise us that the collections of fossil bones are not more numerous than we find them.

Thus we see, there is on the one hand no reason for denying that the deluge has been the cause of all the fossil appearances we perceive; and on the other, that

Earth.

140
General
Examples of
causes
of facts.

141
Examples
of bodies
inclosed by
stone.

142
The deluge
may be sup-
posed the
general
cause of fos-
sil animal
substances.

143
Of fossil
human
bones.

Earth.
144
Dr Hutton's account of the formation of the strata considered.

145
His theory overthrown by an experiment of Bergman's.

146
Wood may be penetrated by flint in a state of solution.

147
Flints may thus grow in the heart of chalk.

148
Extreme absurdity of supposing wood to be penetrated by melted flint.

there is the strongest reason for denying that the land we inhabit has been for a length of time at the bottom of the sea. Dismissing therefore this part of Dr Hutton and Mr Whitehurst's theories, we shall now proceed to consider that of the former, where he investigates the formation of the strata. These, he says, could not be formed by aqueous solution. That they could not be so originally, we readily grant; but that they have preserved themselves from decay, transformed themselves into one another, and repaired their waste by this means, is absolutely certain. The Doctor indeed gives up his own argument; for he tells us, that "if flint can be produced by crystallization from water or any aqueous solution, then may his assertions concerning the consolidation of the strata be denied." But Mr Bergman assures us, that he actually did produce flint by allowing a quantity of fluor acid to stand for two years on some powdered quartz; and this is more than any chemist can pretend to do by the violent heat of fusion, to which Dr Hutton has recourse on all occasions. We do not pretend, however, to say, that the different strata of earth have been formed originally by aqueous solution. For this we must have recourse to the power already mentioned, and for want of which neither Dr Hutton's theory nor any other can support itself. But though the strata were originally formed by Divine power, they are certainly preserved, repaired, and changed by natural causes; of which aqueous solution is a principal, though not the only one.

The said experiment of Mr Bergman's entirely overthrows the Doctor's objection (n^o 39.) relating to the penetration of wood by siliceous or flinty matter. It shows, that the matter in question may be dissolved, and in no very long time deposited in its proper form; so that had Mr Bergman inclosed a bit of wood in his bottle which produced the flint, there is no reason to doubt that it would have been so penetrated by the siliceous matter as to be completely *flintified* (to use Dr Hutton's word) by the end of the two years.

The impossibility which our author talks of, of flinty substances being found insulated in the midst of beds of chalk, is likewise thus removed. But if we view his own account of the petrification of wood by the action of melted flint, what mortal in his senses can give him credit? It exceeds the power of a glass-house furnace to melt flint by itself: how is it possible, then, that the combustible substance of wood should bear to be filled with this dreadful fluid without being burnt? The operation being performed under water, will not answer the purpose: for wood may be reduced to charcoal, by the heat of a burning-glass, under water; and a red hot iron, thrown into a wooden vessel full of water, will burn a hole in the bottom. Dr Black, who mentions this circumstance in his Lectures, very justly observes, that the steam which is produced keeps off the water until the iron has produced its effect. Must not the same effect take place at the bottom of the sea, even granting, what Dr Hutton never can prove, that flint, by any degree of heat whatever, can be reduced to such a state of tenuity as to be capable of penetrating wood like an anatomical injection? Here indeed he may tell us, as on another occasion, that the compression of the water is *insuperable*†. But if this be the case, how comes it to pass, that not only

this insuperable compression, but an additional one (no less than the vast loads of earth which compose the continents of Europe, Asia, Africa, and America), has actually been overcome, and these immense tracts thrown up from the bottom of the ocean, by the force of fire which could not consume a piece of wood?

To suppose that, by any compression whatever, the element of fire, when applied to a combustible body, should be prevented from destroying its texture, is certainly without the least foundation; and yet upon this and similar suppositions proceeds the whole of the Doctor's theory. He differs from those who maintain the volcanic theory, in supposing that fire may work underground in such a manner as to perform none of its common effects, or indeed none but such as are agreeable to his own hypothesis. Thus fire, working at the bottom of the sea, or at an unknown depth under it, shall not burn wood; it shall not extricate the fixed air from calcareous matter, but melt it sometimes into one substance and sometimes into another; it shall not dissipate the most volatile substance, nor in short perform any effect which we ever saw performed by fire: and all this, it seems, is demonstrable by the mere inspection of fragments of stones in a closet, without paying the least attention to the operations of nature abroad.

Though it must be very evident that a theory built on such extravagant principles cannot support itself, we must still take notice of the proofs he adduces from the mineral crystallizations, &c. On this subject it may be observed, that there are various ways by which substances can be crystallized or assume regular figures.

1. The most common is by solution in a large quantity of water, from which the bodies are deposited by cooling, and form distinct and regular crystals. 2. By solution in no greater quantity of boiling water than will keep them suspended; after which they are formed into large masses, as is the case with alum. 3. By slow evaporation, as is the case with vitriolated tartar and some other salts. 4. By efflorescence, when a saline fluid is mixed with a quantity of earthy matter, and kept moist for some time. Of this we often have an example in moist cellars, or other damp places, where we shall see part of the walls covered with a fine, downy, saline matter. In salt-butter also we shall frequently see the same appearance; where the salt shoots into small spicules, though in the common way it crystallizes in cubes. 5. By sublimation, as in the case of flowers of benzoin, of corrosive mercury, cinabar, sal ammoniac, orpiment, &c. &c. 6. By the meeting of two substances in an aerial form, as alkaline and fixed air. By the attraction of fixed air from the atmosphere or otherwise, as is the case with alkaline salts when long exposed to the common air, or for a shorter time to a stream of pure fixed air. 7. By precipitation, as in the arbor Diane and other metallic vegetations. 8. By means of acids. Thus the residuum of Glauber's spirit of nitre, if the distillation has been performed with an excess of acid, will shoot into beautiful ramifications like branches of trees. 9. By fusion, as in regulus of antimony and other metals, sulphur, &c.

Now of all these different ways by which crystallization may be effected, Dr Hutton has chosen only the last; and this he obstinately carries through the whole system

Earth.
149
Contradiction in the Doctor's hypothesis.
150
His suppositions concerning fire entirely unreasonable.

151
His proofs from mineral crystallization considered.

152
Various ways in which substances may be crystallized.

† See n^o 46.

Earth.

153.
Dr Hutton's argument from the insolubility of certain substances is sufficient.

154.
Marmor metallicum formed by crystallization.

155.
How bodies naturally insoluble may be formed by aqueous solution.

156.
Of the formation of felselite.

157.
Fine crystals formed by continued accretion.

158.
Fluor spar may be formed by aqueous solution.

159.
And likewise calcareous spar.

system of nature, whether reasonable or not. His argument against any other mode is chiefly built upon the insolubility of certain substances; but this argument has failed in one very remarkable instance, viz. that of flint, which has been produced by aqueous solution. Another instance he brings, n° 42, of "marmor metallicum, consisting of terra ponderosa saturated with vitriolic acid, a substance insoluble in water." Now though this substance, when once it is formed, may be termed absolutely insoluble; yet the fact is certain, that it may be formed by aqueous solution and crystallization; and we have done so by the following process: Let terra ponderosa be formed into an heap of sulphur by any of the common methods; dissolve the mass in water; filter the solution, and expose it to the air in a vessel kept in a gentle warmth: the phlogiston of the sulphur will gradually fly off; the acid attach itself to the earth; and in a day or two a great quantity of fine crystalline spicules will be formed, which are a true marmor metallicum.

Thus we learn how many bodies, naturally insoluble, may yet be formed by aqueous solution by reason of the solubility of their component parts. Sulphur is soluble by calcareous earth and by terra ponderosa, and makes these substances soluble in much greater quantity than they naturally are. By the decomposition of the solution of terra ponderosa, marmor metallicum is produced; and by decomposing the other, felselite or alabastrum. This last substance Dr Hutton has not thought proper to mention, though huge masses of rock are composed of it; and it is incapable of fusion without being destroyed. Its regular figures, however, afford us a fine example of that species of crystallization which proceeds from precipitation or accretion. The felselite is a substance very little soluble in water; yet by the perpetual deposition of small quantities, we see that beautiful and regular crystals are formed: and hence we learn another important fact, viz. that in order to form these crystals, it is not always necessary that the whole of the substance should be dissolved in water at once, though this is the case with our artificial crystallizations. The largest and most transparent crystals, and even the most insoluble in water, may have been formed by the continual accretion of crystalline matter from an aqueous solution: and thus they may appear in any cavity whatever; for as there is no mineral substance impermeable to water, it evidently follows that no cavities can be impermeable to it.

Among his other insoluble substances Dr Hutton mentions fluor and calcareous spar. But as we know that one of the component parts of fluor is calcareous earth, naturally soluble in water, it is only necessary to suppose a calcareous water like that of Matlock to meet with fluor acid; when as great quantities of fluor would be produced as there are at present of calcareous stone.

The same thing may be said of calcareous spar.—We know that fixed air will precipitate calcareous earth from water, or redissolve it after it has been precipitated, according to its quantity. The formation of spars, therefore, from calcareous matter dissolved in water and fixed air, may easily be understood; and we know that there is no water which does not contain some quantity of calcareous earth. Of fixed air there

is always great plenty in the bowels of the earth; and according to the quantity uniting itself with the dissolved calcareous earth, either chalky concretions or crystalline bodies will be produced. If fire were applied to this calcareous matter in order to fuse it, an emission of the fixed air would be the certain consequence; and without this we have not the least evidence that calcareous earth ever did or could undergo any fusion by heat.

With regard to the mineralization of metals by sulphur, as in the case of pyrites, we cannot pretend to explain them particularly; though it was certainly incumbent on the Doctor to have formed these bodies, or to have produced something like them, by fusion, before he determined that they were formed originally in this way. It is easy, however, to see how the calc of a metal may meet with sulphur in the earth. We know that sulphur is soluble by alkali; by terra ponderosa, or by calcareous earth. By exposing this solution to fixed air, part of the sulphur is separated, and may unite with the metallic earth, or any other thing with which it has an affinity. The crystallizations of sulphur artificially united with metals have not indeed been examined; but before we affirm that a metal is mineralized by fusion with sulphur, we ought to perform something like it artificially, which never has been done.

As to the invincible argument n° 43, where our author triumphantly challenges his adversaries to show how petro-silex, pyrites, and cinnabar, can be dissolved in water; it may be replied, that Mr Bergman has decided the matter against him with regard to the first, by his remarkable experiment of making flint: the second is as yet undecided; for no chemist has been able to make pyrites either by solution or fusion. The third is likewise decided against our theorist; for Dr Lewis has shown that cinnabar may be prepared by solution of sulphur as well as in the dry way by sublimation. We have only to suppose therefore that a calcareous solution of sulphur pervaded this mineral, while a number of particles of quicksilver were dispersed through it; in which case the latter, attracting the sulphureous particles, would form the cinnabar in question.

Our author's argument (n° 44) from metals being found in their perfect state, is very inconclusive. The mass of native iron he speaks of, is by many thought to be factitious; and as to the small bits of other metals sometimes found native, they rather make against him than otherwise: for had they been melted, all the rest of the matters around them must have been melted also; in which case the superior weight of the metals would have carried them to the bottom of the melted mass, there to unite as in a common furnace.

His arguments concerning bituminous bodies are equally unfortunate with the rest. That coal is derived from wood has been the opinion of very learned men, particularly Dr Black. The argument, however, is only this, that sometimes we see coals with woody fibres, plainly indicating their vegetable original. But this would hold equally with regard to stones; for we often see wood penetrated with stony matter, while its fibrous texture still remains. In this case therefore we might as well suppose that stones are derived from wood as that coals are so. A decisive proof that coals are not produced by fusion, is,

Earth that a living toad has been taken out of the heart of a solid piece of coal. This is similar to the entombment of the fishes called *pholades* in the heart of stones; and as, in the latter case, we believe that the stone has concreted round the fish, so we have the same reason to believe, in the former, that the coal had consolidated round the toad. All that we can say therefore is, that coal is formed by a natural, and not very tedious process, unknown to us; but that this process certainly is not fusion. His proof n^o 47 is altogether inconclusive; for we have already seen that stony substances and marmor metallicum may be produced by aqueous solution.

Thus we have seen, that, contrary to our author's hypothesis, the world has undoubtedly had a beginning; that our dry land has not, for ages, been the bottom of the sea; that we may reasonably suppose the deluge to have been the cause of all or most of the fossil appearances of shells, bones, &c. we meet with; that our author has erred in denying to aqueous solution the effects which experience has shown it capable of producing, and in ascribing to fusion effects which experience doth not warrant; and that his theory, far from having any foundation in chemistry, is directly contradicted by that science. It would be tedious and disagreeable to proceed farther in animadverting on a theory so truly unphilosophical, however elaborate and ostentatious in a display of facts: we shall therefore content ourselves with taking notice of one other objection to his doctrine, of which he himself

has been aware, with the answer he has given. The objection is, That there are sometimes found stony and crystalline bodies containing water: It seems therefore a contradiction to say that such were produced by fusion. To this the Doctor replies, "It must not be here objected, that there are frequently found siliceous crystals and amethysts containing water; and that it is impossible to confine water even in melted glass. It is true, that here, at the surface of the earth, melted glass cannot, in ordinary circumstances, be made to receive and inclose condensed water; but let us only suppose a sufficient degree of compression in the body of melted glass, and we can easily imagine it to receive and confine water as well as any other substance. But if, even in our operations, water, by means of compression, may be made to endure the heat of red-hot iron without being converted into vapour, what may not the power of nature be able to perform?"

On this reply we shall only observe, that the truth of this hypothesis, as well as of all other parts of it, may easily be put to the trial by those who have any of these crystals in their possession. Let one of them be broken, and the water it contains examined. If the crystal has been formed by fusion at the bottom of the sea, as Dr Hutton supposes, it will be salt; if otherwise, fresh. As to his doctrine concerning subterranean heat and volcanoes, there will be occasion to consider it under the article VOLCANO.

We must now take into consideration those remarkable changes which are supposed to have taken place on the globe, in such a manner as entirely to have altered its appearance. These, however, do not appear to have any solid foundation. Changes, no doubt, have happened in particular parts; new islands have

been thrown up from the bottom of the sea by the force of subterranean fire, and others have been swallowed up. But these appear to be merely the effects of volcanoes, which are common in many parts of the world; and we are not warranted to conclude, because we see a small volcanic island arise, and another swallowed up, that this has been the case with the whole habitable world.—An imperfect theory hath indeed been suggested by Sir William Hamilton, Mr Brydone, and others, concerning the use of volcanoes and subterranean fires; from whence it might seem probable, though they do not indeed say so in direct terms, that all the dry land was originally thrown up from the bottom of the sea by the force of these fires. Sir William Hamilton, in his letter to Dr Maty, broaches this theory in the following words. "I am myself convinced, that the whole circuit, so far as I have examined, within the boundaries marked in the map (extending at least 50 Italian miles in length, and 30 in breadth where broadest), is wholly and totally the production of subterranean fires; and that most probably the sea formerly reached the mountains that lie behind Capna and Caserta, and are a continuation of the Apennines. If I may be allowed to compare small things with great, I imagine the subterranean fires to have worked in this country under the bottom of the sea, as moles in a field, throwing up here and there a hillock; and that the matter thrown out of some of these hillocks formed into settled volcanoes, filling up the space between the one and the other, has composed this part of the continent, and many of the islands adjoining.

"From the observations I have made upon Mount *Ætna*, *Vesuvius*, and the neighbourhood, I dare say that, after a careful examination, most mountains that are, or have been, volcanoes, would be found to owe their existence to subterraneous fire; the direct reverse of what I find the commonly received opinion. —Nature, though varied, is certainly in general uniform in her operations; and I cannot conceive, that two such considerable volcanoes as *Ætna* and *Vesuvius*, should have been formed otherwise than every other considerable volcano of the known world. I do not wonder that so little progress hath been made in the improvement of natural history, and particularly in that branch of it which regards the theory of the earth: Nature acts slowly; it is difficult to catch her in the fact.

"From repeated observations I have made in the neighbourhood of *Vesuvius*, I am sure that no virgin soil is to be found there; and that all is composed of different strata of erupted matter, even to a great depth below the level of the sea. In short, I have not any doubt in my own mind but that this volcano took its rise from the bottom of the sea; and as the whole plain between *Vesuvius* and the mountains behind *Caserta*, which is the best part of *Campagna Felice*, is (under its good soil) composed of burnt matter, I imagine the sea to have washed the feet of those mountains, until the subterraneous fires began to operate, at a period certainly of a most remote antiquity.

"The soil of the *Campagna Felice* is very fertile; I saw the earth opened in many places. The stratum of good soil was in general four or five feet thick; under which was a deep stratum of cinders, pumice, fragments of lava, and such burnt matter as abounds near Mount

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Mount Vefuvius and all volcanoes. The mountains at the back of Caferta are moftly of a fort of limetone, and very different from thofe formed by fire; though Signior Van Vitelli, the celebrated architect, has affured me, that in the cutting of the famous aqueduct of Caferta through thefe mountains, he met with fome foils that had evidently been formed by fubterraneous fires. The high grounds which extend from Caftel-a-Mare to the point of Minerva towards the ifland of Caprea, and from the promontory that divides the bay of Naples from that of Salerno, are of limetone. The plain of Sorrento, that is bounded by thefe high grounds, beginning at the village of Vico, and ending at that of Maffa, is wholly compofed of the fame fort of tufa as that about Naples, except that the cinders or pumice-ftones intermixed in it are larger than in the Naples tufa. I conceive, then, that there has been an explofion in this fpot from the bottom of the fea. This plain, as I have remarked to be the cafe with all foils produced by fubterraneous fire, is extremely fertile; whilft the ground about it, being of another nature, is not fo. The ifland of Caprea does not fhew any figns of having been formed by fubterraneous fire, but is of the fame nature as the high grounds laft mentioned; from whence it has been probably detached by earthquakes, or the violence of the waves. Rovigliano, an ifland, or rather a rock, in the bay of Caftel-a-Mare, is likewife of limetone, and feems to have belonged to the original mountains in its neighbourhood: in fome of thefe mountains alfo, there are petrified fifh and foffile fhells, which I never have found in the mountains which I fuppofe to have been formed by explofion. Bracini, however, in his account of the eruption of 1613, fays, that he found many forts of fea fhells on Vefuvius after that eruption; and P. Ignatio, in his account of the fame eruption, fays, that he and his companions picked up many fhells likewife at that time upon the mountain: this circumftance would induce one to believe, that the water thrown out of Vefuvius during that formidable eruption came from the fea."

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Insufficiency of the volcanic theory.

This may ferve to fhew upon what grounds the volcanic theory ftands: but though we fhould admit it in its utmoft extent, the theory of the earth can receive but very little affiftance from it. Sir W. Hamilton himfelf does not fay that all the mountains have been volcanoes, or that all the foil throughout the different quarters of the world hath been thrown up from the bottom of the fea. If, therefore, there remains but one mountain in the whole world which never was a volcano, we fhall be as much difculted to account for the production of that one, as though there were ever fo many; and at any rate our theory will be abfolutely ufelefs, becaufe what will account for the origin of that mountain, will alfo account for the origin of others. If we go a ftep beyond our author, and fay, that there are no mountains whatever that have not been originally volcanoes, but that all the dry land is the production of fubterraneous fire, our difficulties are fo far from being removed, that they are greatly increafed. The lavas and volcanic afhes, though in time they become covered with an exceedingly fertile foil, remain abfolutely barren for a great number of years; in fomuch that, by the adopters of the volcanic hypothefis, the

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period at which Mofes fixes the creation is reckoned by far too late to have given time for covering the many lavas of Italy and Sicily with the depth of earth they juft now have upon them. The whole world therefore muft have remained for many ages in a ftate of abfolute fertility; and by what means or in what corner of the world vegetation firft began, remains to be inquired into.

Without entering further into the theories either of Sir W. Hamilton or any other perfon, it is eafy to fee, that all of them are insufficient to folve the difficulties mentioned n° 11. It is common to account for the fpheroidal figure of the earth, from the greater centrifugal force of the equatorial parts than of the polar ones; but this explication can by no means be deemed fufficient. The globe we inhabit is compofed of two very different kinds of matter, earth and water. The former has a very confiderable power of cohesion, beftides the gravitating power; the latter has very little cohesion, and its parts may be feparated from each other by whatever will overcome its weight. It follows, therefore, that the folid parts of the earth, refifting, by their cohesion, the centrifugal force more than the water, ought not to dilate fo much. The waters of the ocean therefore ought, about the equator, to fwell up and overflow the land; and this they ought to do at this prefent moment as much as at the firft creation. That this ought to be the cafe, is evident from the phenomena of the tides. It is not to be doubted but that the attraction of the moon affects the folid earth as well as the fea; but becaufe of the greater cohesion of the former, it cannot yield as the ocean does, and therefore the waters are raifed to fome height above it. Mr. Whitehurft and others indeed folve this difficulty by fuppofing the earth to have been originally fluid. But this is arguing in a circle: for if we defire them to prove this original fluidity, they will do it by the fpheroidal figure of the earth; and if the caufe of the fpheroidal figure is required, they refer us to the original fluidity. See *Whitehurft's Inquiry*.—The height to which the waters would have covered the equatorial parts by the centrifugal force, muft have been equal to the deprefion at the poles; which, according to M. Buffon, is about 17 miles; according to other mathematicians, 25 or 26 miles.

The other difficulties are fo totally inexplicable, that Buffon, who feems to exert himfelf as much as poffible in order to remove them, is obliged at laft to own, that the earth is in a perishing ftate; that the hills will be levelled, and the ocean at laft cover the whole face of the earth; a prophecy which wears no very favourable afpect to the inhabitants of this globe. —For thefe imaginations, however, there does not feem to be the fmalleft foundation in nature. The mountains have continued what they were, from the earlieft accounts of time, without any figns of decay. Mount Ætna, beftides the wafte common to it with other mountains, hath been exhaufting itfelf by throwing out incredible quantities of its own fubftance; yet it ftill feems to be what it was called by Pindar 2200 years ago, the *pillar of heaven*. It feems extremely probable, Natural

therefore, that there are powers in the fyftem of nature which tend to pferve, and are capable of counteracting thofe which tend to deftroy, the mountains; and per-
haps

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Centrifugal force not the caufe of the earth's fpheroidal figure.

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the powers for preserving the mountains.

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haps the late discovery concerning the attraction of mountains may some time or other throw some light on the nature of these powers. See MOUNTAIN.

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The like may be said of the isthmuses or narrow necks of land which in some parts of the world join different countries together; such as the isthmus of Darien, of Suez, the Morea, &c. Though the ocean seems to beat on these with great violence, they are never diminished in bulk, or washed away, as, according to Buffon's theory, they ought to be. It is plain, therefore, that there is in nature some power by which these narrow necks of land are preserved from the fury of the ocean; for history does not afford one instance of any neck of land of this kind being broken down by the sea.—It seems impossible to solve the difficulties with regard to the strata and shells by any other means than supposing, that there are in the terrestrial matter several distinct powers, by which the strata of any particular kind are occasionally transformed into others; and that the shells and other marine bodies were originally deposited on the surface by the deluge. The volcanic hypothesis, by which some attempt to account for the appearance of these bodies, will in no shape answer the purpose. By the explosions of a volcano, shells, mud, sand, &c. might be indiscriminately thrown up, and scattered irregularly about; but we could never find the large beds of shells which are frequently to be met with of a considerable extent in different parts of the earth.

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Notion of
a chaos
ought not
to be adopt-
ed.

With regard to any degree of certainty, it is scarcely to be hoped for on this subject. The common notion of the earth's being originally a chaos, seems neither to have a foundation in reason, nor in the Mosaic account of the creation. It is surely inconsistent with the wisdom ascribed to the Deity, to think that he would create this visible system in confusion, and then employ it to put itself in order. It seems more probable, that the earth was originally created with the inequalities of surface we see it have, and that the natural powers for preserving it were afterwards superadded. Thus, according to Moses, the first natural agent created, or produced, by directing matter to move in a certain manner, was *light*. This, we know, was absolutely necessary for the evaporation of the water which took place on the second day. Moses tells us, that the earth was originally covered with water: and we see a natural reason why it should be so; namely, that the evaporation by the atmosphere might more easily take place. When this was done, there being then no more occasion for the waters in that diffused state, they were commanded to retire into the place appointed for them, and thus formed the ocean. Whether this was done by the action of gravity then first taking place, or by any other means, we have it not in our power to know, nor will our speculations on this subject probably be attended with much benefit. We see, however, that the Mosaic account of the creation is perfectly consistent with itself, and free from those difficulties with which other systems are clogged. It is impossible to show, how, by any natural power, a confused mass of matter, such as the chaos of the ancient poets, of Drs Burnet and Woodward, the hollow globe of Mr Hutchison, the comet of Mr Whiston, or the vitrified matter of M. Buffon, could put itself in the or-

der in which we see it. The sacred historian simply tells us, that God created the heavens and the earth; that the heavens gave no light, and the earth was covered with water. He first commanded the light to shine, then the air to take up what quantity of water he thought proper for the purposes of vegetation. After this, the dry land was made to appear; and the different powers of vegetation already taken notice of were given to it. Next the sun and moon were created as subordinate agents, to *divide the light from the darkness*, &c. Then followed the formation of animals and of man.

According to this account, it would appear, that Mosaic what we call the *laws of nature*, were given to preserve the earth in that shape which the Deity thought proper to give it originally by his own power; and by no means to form it in any particular way, much less to put it out of the form which he had already given it: and thus the world, according to the best accounts we have, is very little altered in its appearance; and, according to what we can judge, will continue unaltered for ever, unless the Creator thinks proper to interpose in such a manner as to supersede all the laws he hath given it, and change it into some other form.

From some observations of Sir W. Hamilton and others, objections have been drawn, as hath been already mentioned, to the Mosaic chronology. These objections are in substance as follows. In pits, and other natural and artificial openings of the ground, in the neighbourhood of Vesuvius and *Ætna*, several beds of lava have been discovered at considerable depths below each other. These beds of lava in some places are covered with successive strata of vegetable mould. From this disposition of materials, Sir William concludes that the world must have been created at a much more remote period than is generally believed. The different strata of lava found below ground, he observes, must have proceeded from an equal number of eruptions from the mountain; and such of them as are covered with vegetable soil must have remained at least 1000 years on the surface before they could acquire a soil sufficient for the purposes of vegetation. Ten or twelve successive strata overlaid with soil have already been discovered in the bowels of the earth; and it has been strongly asserted, that, by digging deeper, many more might have been found. Now, allowing 1000 years for each stratum of lava, which the supporters of this theory affirm to be too little, the antiquity of the earth cannot be less than 12,000 years, which is more than double its age according to the Mosaic account.

The principal fact in this theory is, that 1000 years are necessary to the production of a soil sufficient for the nourishment and growth of vegetables upon volcanic lavas. This notion is confirmed by a conjecture of the Canonico Recupero, that streams of lava in Sicily have lain for centuries without acquiring a vegetable mould; and by some obscure accounts, that these lavas have proceeded from eruptions of *Ætna* above 1000 years ago. The following considerations, however, will render this theory at least extremely dubious.

Sir William informs us, that some lavas are very solid, and resist the operation of time much longer than another kind, which, he says, "is farinaceous, the particles separating as they force their way out, just like meal

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meal coming from under the grindstones. A stream of lava of this sort (he justly observes), being less compact, and containing more earthy particles, would certainly be much sooner fit for vegetation than one composed of the more perfect vitrified matter." He has not, however, ventured to determine whether these lavas found below ground were of the former or latter quality; a circumstance which materially affects the justness of his calculation.

That soil gradually increases by decayed vegetables, and the sediment deposited by snow and rain, is an undeniable fact. The thickness or thinness of soil indicates a greater or less time of accumulation. But Sir William has not informed us of the dimensions of his subterranean vegetable strata; a circumstance of great moment in instituting a calculation of their different eras.

Besides, eruptions of volcanoes are often accompanied with incredible quantities of ashes, which fall thick upon all the ground for many miles round; intended by nature, it would appear, quickly to repair the barrenness occasioned by the lava. The muddy water sometimes thrown out may co-operate powerfully with the ashes in producing the same happy effect.

But Sir William has furnished us with facts of a more important nature. The town of Herculaneum was destroyed by an eruption in the 97th year of the Christian era. There are evident marks, says he, that the matter of six eruptions has taken its course over Herculaneum; for each of the six strata of lava is covered with a vein of good soil. Here we have Sir William's own authority for six strata of *good soil*, accumulated in less than 1700 years; which, supposing them to be all of equal thickness, instead of 1000 years, leaves not 300 to the production of each.

From the same authority we learn, that the crater on the top of the Monte Nuovo, or New Mountain, which was thrown up by subterranean fire no farther back than the year 1538, is now covered with shrubs.

There is not on record any eruption from the great crater of Vesuvius from the year 1139 to 1631, a period of only 492 years. But Bracini, who descended into it not long before the 1631, tells us, "that the crater was five miles in circumference, and about 1000 paces deep. Its sides were covered with brushwood, and at the bottom there was a plain on which cattle grazed. In the woody parts, bears frequently harboured," &c.

The correspondence of these facts, related by Sir William himself, with his favourite notion that 1000 years are necessary for the production of a vegetable soil, we leave to the reader's consideration; and shall conclude with a few remarks of a different kind.

The appearance of a stratum of lava below ground, though not covered with vegetable soil, our author considers as demonstrative evidence, that such stratum formerly lay above the surface, and was thrown out by an eruption. This inference, however, seems not altogether just. Nothing, with propriety, receives the denomination of an eruption, unless when lava or other matter is vomited from the crater, or from some new opening made in the mountain. But it deserves notice, that, in the environs of volcanoes, earthquakes are fre-

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quent. That these violent concussions are the genuine produce of subterranean fire expanding itself in every direction, and making strong efforts against every substance which resists the natural tendency of its course, is a fact that cannot admit of doubt. It is no less certain, that these frequent concussions shake and dislocate the internal parts of the earth. They cannot fail to shatter and disarrange the natural direction of the original strata; and, of course, they must give rise to many subterranean cavities and fissures. The nearer the great furnace, which confines the fury of the flames, the greater and more frequent will be the cavities. Every earthquake occasioned by a volcano is nothing else than an effort of the burning matter to enlarge the boundaries by which it is usually limited. If the quantity of matter and degree of inflammation require a space greatly superior to the internal cavities, an eruption above the surface is an infallible consequence: but when the quantity of matter, or the expansive force occasioned by the degree of inflammation, is insufficient to raise the lava to the top of the mountain, an earthquake may be produced; and the lava, without ever appearing above the surface, may run below ground in plentiful streams, and fill up all the subterranean cavities and channels. These internal strata of lava may often lie so deep as to be below the level of the sea. In this manner, we conceive it to be not only possible, but extremely probable, that beds of lava, having no covering of vegetable soil, may be found at great depths, although they never were above the surface.

It is much more reasonable to conclude, that lavas with a layer of soil were produced by eruptions, and once lay above the surface, till covered by the operation of time, or subsequent streams from the mouth of the volcano. But even in this case, the argument is not altogether complete; for, as above remarked, earthquakes, with which countries adjacent to volcanoes are perpetually infested, often sink large tracts of land to great depths.

The other parts of the theory of the earth regard the situation of the different parts of its surface with respect to each other; its annual motion round the sun as a planet; its diurnal motion round its axis; and the different strata whereof it is composed, as far as it hath been hitherto found practicable to penetrate into it: for all which, see the articles GEOGRAPHY, ASTRONOMY, MINES, STRATA, &c.

Smell and Bath of the Earth. See AGRICULTURE, n^o 10.

Bread made of Earth. See BREAD.

Earth-Flax. See AMIANTHUS.

Earth-Nuts, or Ground-Nuts, the roots of the *Arachis hypogæa* of Linnæus. They are composed of several small round bulbs or knots; whence they were termed by Dodonæus, *terre glandes* or *earth-nuts*. They are esteemed an excellent food by the Siberians.

In Holland likewise, they are sold in the markets and used for food. The native country of this plant seems to be Africa; though, at present, all the American settlements abound with it; but many persons who have resided in that country affirm that they were originally brought by the slaves from Africa. The plant multiplies very fast in a warm country; but being very impatient of cold, it cannot be propagated in the open

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air in Britain. The seeds must therefore be planted in a hot-bed in the spring of the year; and when the weather proves warm, they may be exposed to the open air by degrees. The branches of the plant trail upon the ground; and the flowers, which are yellow, are produced single upon long footstalks; and as soon as the flower begins to decay, the germen is thrust under ground, where the pod is formed and ripened; so that unless the ground is opened, they never appear: the roots are annual, but the nuts or seeds sufficiently stock the ground in a warm country where they are not carefully taken up.

EARTH-Nuts, or Pig-Nuts. See BUNION.

EARTH-Pucerons, in natural history, a name given by authors to a species of puceron very singular in its place of abode. In the month of March, if the turf be raised in several places in any dry pasture, there will be found, under some parts of it, clusters of ants; and, on a farther search, it will be usually found, that these animals are gathered about some pucerons of a peculiar species. These are large, and of a greyish colour, and are usually found in the midst of the clusters of ants.

The common abode of the several other species of pucerons is on the young branches or leaves of trees; as their only food is the sap or juice of vegetables, probably these *earth* kinds draw out those juices from the roots of the grasses, and other plants, in the same manner that the others do from the other parts. The ants that conduct us to these, are also our guides where to find the greater part of the others: the reason of which is, that as these creatures feed on the saccharine juices of plants, they are evacuated from their bodies in a liquid form, very little altered from their original state; and the ants, who love such food, find it ready prepared for them in the excrements which these little animals are continually voiding*.

* See *Aphis*, and *Honey-dew*. It has been supposed by some, that these were the common pucerons of other kinds, which had crept into the earth to preserve themselves from the rigour of the winter. But this does not appear to be the case; for they are usually met with in places very distant from trees or plants, on which they should be supposed before to have fed; and it is very certain, that though many of these insects are killed by the cold, yet many escape, and are found very early in the spring, sucking the buds of the peach-tree. There is no doubt of these creatures being in a feeding condition when under ground; because otherwise the ants would have no temptation to follow them: and it is equally certain, that the several species of the pucerons, like those of the caterpillar kinds, have each their peculiar herbs on which they feed, as many of them will die of hunger rather than feed on any others; and it is not at all likely, that these earth pucerons had been used to feed on leaves of trees and plants, and had left that food for the roots of grass.

EARTH-Worms. See LUMBRICUS.

EARTHQUAKE, in natural history, a sudden and violent concussion of the earth, generally attended with strange noises under-ground or in the air; often destroying whole cities at once, throwing down rocks, altering the course of rivers, and producing the most terrible devastations.

Though there is hardly any country known in which

shocks of an earthquake have not at some time or other been felt, yet there are some much more subject to them than others. It hath been observed, that northern countries in general are less subject to earthquakes than those situated near the equator, or in the southern latitudes; but this does not hold universally. The islands of Japan, which are situated pretty far north, are nevertheless exceedingly liable to these destructive phenomena. Islands, in general, are also more subject to earthquakes than continents; but neither does this hold without exceptions. Some particular parts of continents, and some particular islands, are more subject to them than others lying in the neighbourhood, and differing very little from them in external appearance. Thus, Portugal is more subject to earthquakes than Spain, and the latter much more than France; Mexico and Peru more than the other countries of America, and Jamaica more than the other Caribbee islands. Earthquakes are frequent, though not often violent, in Italy; but in Sicily they are often terribly destructive. Asia Minor has been remarkably subject to them from the remotest antiquity; and the city of Antioch in particular hath suffered more from earthquakes than any other in that country. The same phenomena are said also to occur very frequently in the north-eastern extremities of Asia, even in very high latitudes.

Though there are no phenomena in nature more calculated to impress the human mind with terror, and consequently to be well remembered and taken notice of, than earthquakes; yet the philosophy of them is but lately arrived at any degree of perfection; and even at this day, the history of earthquakes is very incomplete. The destruction occasioned by them engrosses the mind too much to admit of philosophical speculations at the time they happen: the same thing prevents the attentive consideration of the alterations that take place in the atmosphere after the earthquake is over, and which might probably throw some light on the causes which produced it; and the suddenness of its coming on prevents an exact attention to those slight appearances in the earth or air, which, if carefully observed, might serve as warnings to avoid the destruction.—From what observations have been made, however, the following phenomena may be deduced, and reckoned pretty certain.

1. Where there are any volcanoes or burning mountains, earthquakes may reasonably be expected more frequently than in other countries.

2. If the volcano hath been for a long time quiet, a violent earthquake is to be feared, & vice versa. But to this there are many exceptions.

3. Earthquakes are generally preceded by long droughts; but they do not always come on as soon as the drought ceases.

4. They are also preceded by electrical appearances in the air; such as the aurora borealis, falling stars, &c.: but this does not hold universally.

5. A short time before the shock, the sea swells up and makes a great noise; fountains are troubled, and send forth muddy water; and the beasts seem frightened, as if sensible of an approaching calamity.

6. The air at the time of the shock is generally calm and serene; but afterwards commonly becomes obscure and cloudy.

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quake.

What countries are most subject to earthquakes.

History of their phenomena incomplete.

Account of the phenomena as far as yet ascertained.

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quake.Earth-
quake.

7. The shock comes on with a rumbling noise, sometimes like that of carriages; sometimes a rushing noise like wind, and sometimes explosions like the firing of cannon are heard. Sometimes the ground heaves perpendicularly upwards, and sometimes rolls from side to side. Sometimes the shock begins with a perpendicular heave, after which the other kind of motion commences. A single shock is but of very short duration, the longest scarcely lasting a minute; but they frequently succeed each other at short intervals for a considerable length of time.

8. During the shock, chafms are made in the earth; from which sometimes flames, but oftener great quantities of water, are discharged. Flame and smoke are also emitted from places of the earth where no chafms can be perceived. Sometimes these chafms are but small; but, in violent earthquakes, they are frequently so large, that whole cities sink down into them at once.

9. The water of the ocean is affected even more than the dry-land. The sea swells to a prodigious height; much more than we could suppose it raised by the mere elevation of its bottom by the shock. Sometimes it is divided to a considerable depth; and great quantities of air, flames, and smoke, are discharged from it. The like irregular agitations happen to the waters of ponds, lakes, and even rivers.

10. The shock is felt at sea as well as on land. Ships are affected by a sudden stroke, as if they had run aground or struck upon a rock.

11. The effects of earthquakes are not confined to one particular district or country, but often extend to very distant regions; though no earthquake hath yet been known extensive enough to affect the whole globe at one time. In those places also where the shock is not felt on dry land, the irregular agitation of the waters above mentioned is perceived very remarkably.

4
Account of
the earth-
quake in
Jamaica in
1692.

All these positions are verified by the accounts of those earthquakes which have been particularly described by witnesses of the best character. In 1692, an earthquake happened in Jamaica, attended with almost all the terrible circumstances above mentioned. In two minutes, it destroyed the town of Port Royal, at that time the capital of the island; and sunk the houses in a gulph 40 fathoms deep. It was attended with an hollow rumbling noise like that of thunder: the streets rose like the waves of the sea; first lifting up the houses, and then immediately throwing them down into deep pits. All the wells discharged their waters with the most violent agitation. The sea burst over its bounds, and deluged all that stood in its way. The fissures of the earth were in some places so great, that one of the streets appeared twice as broad as formerly. In many places it opened and closed again; and continued this agitation for some time. Of these openings, great numbers might be seen at once. In some of them, the people were swallowed up at once; in others, the earth caught them by the middle, and crushed them to death; while others, more fortunate, were swallowed up in one chafm, and thrown out alive by another. Other chafms were large enough to swallow up whole streets; and others, still more formidable, spouted up immense quantities of water, drowning such as the earthquake had spared. The whole was attended with stench and

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offensive smells, the noise of falling mountains at a distance, &c.; and the sky, in a minute's time, was turned dull and reddish, like a glowing oven. Yet, as great a sufferer as Port-Royal was, more houses were left standing therein than on the whole island besides. Scarce a planting-house, or sugar-house, was left standing in all Jamaica. A great part of them were swallowed up, houses, people, trees, and all, in one gap: in lieu of which, afterwards appeared great pools of water; which, when dried up, left nothing but sand, without any mark that ever tree or plant had grown thereon. The shock was so violent, that it threw people down on their knees or their faces as they were running about for shelter. Several houses were shuffled some yards out of their places, and yet continued standing. One Hopkins had his plantation removed half a mile from the place where it stood, without any considerable alteration. All the wells in the island, as well as those of Port-Royal, from one fathom to six or seven deep, threw their water out at the top with great violence. Above 12 miles from the sea, the earth gaped and spouted out, with a prodigious force, vast quantities of water into the air: yet the greatest violences were among the mountains and rocks; and it is a general opinion, that the nearer the mountains, the greater the shock; and that the cause thereof lay among them. Most of the rivers were stopped up for 24 hours by the falling of the mountains; till swelling up, they made themselves new tracks and channels; tearing up, in their passage, trees, &c. After the great shock, those people who escaped got on board ships in the harbour, where many continued above two months; the shocks all that time being so violent, and coming so thick, sometimes two or three in an hour, accompanied with frightful noises like a rushing wind, or a hollow rumbling thunder, with brimstone-blasts, that they durst not come ashore. The consequence of the earthquake was a general sickness, from the noisome vapours belched forth, which swept away above 3000 persons.

A still more terrible account, if possible, is that given by Kircher, of the earthquake which happened in Calabria in the year 1638. This instance is an exception to the second general position above laid down. In Italy, there had been an eruption of Mount Vesuvius five years before; and in Sicily there had been an eruption of *Ætna* only two years before this earthquake. The event, however, plainly shewed, that the cause of the earthquake, whatever it was, had a connection not only with Mount *Ætna*, which lies in the neighbourhood, but also with the volcano of Stromboli, which is 60 miles distant. "On the 24th of March (says Kircher), we lanced (in a small boat) from the harbour of Messina in Sicily, and arrived the same day at the promontory of Pelorus. Our destination was for the city of Euphemia in Calabria; but on account of the weather, we were obliged to continue three days at Pelorus. At length, wearied with the delay, we resolved to prosecute our voyage; and although the sea seemed more than usually agitated, yet we ventured forward. The gulph of Charybdis, which we approached, seemed whirled round in such a manner as to form a vast hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to Mount *Ætna*, I saw it cast forth large volumes of smoke, of

5
Of the earthquake
in Calabria
in 1638.

L 1 moun-

mountainous size, which entirely covered the island, and blotted out even the shores from my view. This, together with the dreadful noise, and the sulphurous fench, which was strongly perceived, filled me with apprehensions that some more dreadful calamity was impending. The sea itself seemed to wear a very unusual appearance; those who have seen a lake in a violent shower of rain all covered over with bubbles, will have some idea of its agitations. My surprise was still increased by the calmness and serenity of the weather; not a breeze, not a cloud, which might be supposed to put all nature thus into motion. I therefore warned my companion, that an earthquake was approaching; and, after some time, making for the shore with all possible diligence, we landed at Tropæa. But we had scarce arrived at the Jesuits college in that city, when our ears were stunned with an horrid sound, resembling that of an infinite number of chariots driven fiercely forward, the wheels rattling and the thongs cracking. Soon after this, a most dreadful earthquake ensued; so that the whole track upon which we stood seemed to vibrate, as if we were in the scale of a balance that continued waving. This motion, however, soon grew more violent; and being no longer able to keep my legs, I was thrown prostrate upon the ground. After some time, finding that I remained unhurt amidst the general concussion, I resolved to venture for safety; and running as fast as I could, reached the shore. I did not search long here, till I found the boat in which I had landed, and my companions also. Leaving this seat of desolation, we prosecuted our voyage along the coast; and the next day came to Ro-chetta, where we landed, although the earth still continued in violent agitations. But we were scarce arrived at our inn, when we were once more obliged to return to our boat; and in about half an hour we saw the greatest part of the town, and the inn at which we had fed up, dashed to the ground, and burying all its inhabitants beneath its ruins. Proceeding onward in our little vessel, we at length landed at Lopizium, a castle mid-way between Tropæa and Euphemia the city to which we were bound. Here, wherever I turned my eyes, nothing but scenes of ruin and horror appeared; towns and castles levelled to the ground; Stromboli, though at 60 miles distance, belching forth flames in an unusual manner, and with a noise which I could distinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling found of an approaching earthquake, which by this time we were grown acquainted with, alarmed us for the consequences. It every moment seemed to grow louder, and to approach more near. The place on which we stood now began to shake most dreadfully; so that, being unable to stand, my companions and I caught hold of whatever shrub grew next us, and supported ourselves in that manner. After some time, the violent paroxysm ceasing, we again stood up, in order to prosecute our voyage to Euphemia, which lay within sight. In the mean time, while we were preparing for this purpose, I turned my eyes towards the city; but could see only a frightful dark cloud, that seemed to rest upon the place. This the more surprised us, as the weather was so very serene. We waited, therefore, till the cloud was passed away; then turning to look for the city, it was totally sunk; and

nothing but a dismal and putrid lake was to be seen where it stood."

In 1693 an earthquake happened in Sicily, which may justly be accounted one of the most terrible of which we have any account. It shook the whole earthquake island: and not only that, but Naples and Malta shared in the shock. It was impossible for any body in this country to keep on their legs on the dancing earth; nay, those that lay on the ground were tossed from side to side as on a rolling billow: high walls leaped from their foundations several paces, &c. The mischief it did is amazing; almost all the buildings in the countries were thrown down. Fifty-four cities and towns, beside an incredible number of villages, were either destroyed or greatly damaged. We shall only instance the fate of Catania, one of the most famous, ancient, and flourishing cities in the kingdom; the residence of several monarchs, and an university. This once famous city had the greatest share in the tragedy. Father Anthon. Serrovita, being on his way thither, and at the distance of a few miles, observed a black cloud like night hovering over the city; and there arose from the mouth of Montgibello great spires of flame, which spread all around. The sea all of a sudden began to roar and rise in billows; and there was a blow, as if all the artillery in the world had been at once discharged. The birds flew about astonished; the cattle in the fields ran crying, &c. His and his companions horses stopped short, trembling; so that they were forced to alight. They were no sooner off, but they were lifted from the ground above two palms; when casting his eyes towards Catania, he with amazement saw nothing but a thick cloud of dust in the air. This was the scene of their calamity; for of the magnificent Catania, there was not the least footstep to be seen. S. Bonajutus assures us, that of 18000 inhabitants, 18000 perished therein.

The great earthquake, however, which happened on the 1st of November 1755, affords the clearest example of all the phenomena above mentioned; having been felt violently in many places both on land and at sea, and extended its effects to the waters in many other places where the shocks were not perceived. At Lisbon in Portugal its effects were most severe. In 1750, there had been a sensible trembling of the earth felt in this city: for four years afterwards, there had been an excessive drought; inasmuch that some springs, formerly very plentiful of water, were dried and totally lost. The predominant winds were north and north-east, accompanied with various, though very small, tremors of the earth. The year 1755 proved very wet and rainy; the summer cooler than usual; and for 40 days before the earthquake, the weather was clear, but not remarkably so. The last day of October, the sun was obscured, with a remarkable gloominess in the atmosphere. The first of November, early in the morning, a thick fog arose, which was soon dissipated by the heat of the sun; no wind was stirring; the sea was calm; and the weather as warm as in June or July in this country. At 35 minutes after nine, without the least warning, except a rumbling noise not unlike the artificial thunder in our theatres, a most dreadful earthquake shook, by short but quick vibrations, the foundations of all the city, so that many buildings instantly fell. Then, with a scarce perceptible pause, the nature of the motion:

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was changed, and the houses were tossed from side to side, with a motion like that of a wagon violently driven over rough stones. This second shock laid almost the whole city in ruins, with prodigious slaughter of the people. The earthquake lasted in all about six minutes. At the moment of its beginning, some persons on the river, near a mile from the city, heard their boat make a noise as if it had run aground, though they were then in deep water; and at the same time they saw the houses falling on both sides of the river. The bed of the river Tagus was in many places raised to its surface. Ships were driven from their anchors, and jolted together with great violence; nor did their masters know whether they were afloat or aground. A large new quay sunk to an unfathomable depth, with several hundreds of people who were upon it; nor was one of the dead bodies ever found. The bar was at first seen dry from shore to shore: but suddenly the sea came rolling in like a mountain; and about Belem Castle the water rose 50 feet almost in an instant. About noon there was another shock; when the walls of several houses that yet remained were seen to open from top to bottom more than a quarter of a yard, and afterwards closed again so exactly that scarce any mark of the injury was left.

At Colares.

At Colares, about 20 miles from Lisbon, and two miles from the sea, on the last day of October, the weather was clear, and uncommonly warm for the season. About four o'clock in the afternoon there arose a fog, which came from the sea, and covered the valleys; a thing very unusual at that season of the year. Soon after, the wind changing to the east, the fog returned to the sea, collecting itself, and becoming exceeding thick. As the fog retired, the sea rose with a prodigious roaring. The first of November, the day broke with a serene sky, the wind continuing at east; but about nine o'clock the sun began to grow dim; and about half an hour after was heard a rumbling noise like that of chariots, which increased to such a degree, that it became equal to the explosions of the largest cannon. Immediately a shock of an earthquake was felt, which was quickly succeeded by a second and third; and at the same time several light flames of fire issued from the mountains, resembling the kindling of charcoal. In these three shocks, the walls of the buildings moved from east to west. In another situation, from whence the sea-coast could be discovered, there issued from one of the hills called the *Fojo* a great quantity of smoke, very thick, but not very black. This still increased with the fourth shock, and afterwards continued to issue in a greater or less degree. Just as the subterraneous rumblings were heard, the smoke was observed to burst forth at the *Fojo*; and the quantity of smoke was always proportioned to the noise. On visiting the place from whence the smoke was seen to arise, no signs of fire could be perceived near it.

At Oporto.

At Oporto (near the mouth of the river Douro), the earthquake began about 40 minutes past nine. The sky was very serene; when a dreadful hollow noise like thunder, or the rattling of coaches at a distance, was heard, and almost at the same instant the earth began to shake. In the space of a minute or two, the river rose and fell five or six feet, and continued to do so for four hours. It ran up at first with so much violence, that it broke a ship's hawser. In some parts the river

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opened, and seemed to discharge vast quantities of air; and the agitation in the sea was so great about a league beyond the bar, that air was supposed to have been discharged there also.

St Ube's, a sea-port town about 20 miles south of At St Ube's. Lisbon, was entirely swallowed up by the repeated shocks and the vast surf of the sea. Huge pieces of rock were detached at the same time from the promontory at the west end of the town, which consists of a chain of mountains containing fine Jasper of different colours.

The same earthquake was felt all over Spain, except At Ayamonte in Catalonia, Arragon, and Valencia. At Ayamonte (near where the Guadiana falls into the Bay of Cadiz), a little before 10 o'clock on the first of November, the earthquake was felt; having been immediately preceded by a hollow rushing noise. Here the shocks continued for 14 or 15 minutes, damaged almost all the buildings, throwing down some, and leaving others irreparably shattered. In little more than half an hour after, the sea and river, with all the canals, overflowed their banks with great violence, laying under water all the coasts of the islands adjacent to the city and its neighbourhood, and flowing into the very streets. The water came on in vast black mountains, white with foam at the top, and demolished more than one half of a tower at the bar named *De Canala*. In the adjacent strands every thing was irrecoverably lost; for all that was overflowed sunk, and the beach became a sea, without the least resemblance of what it was before. Many persons perished; for although they got aboard some vessels, yet part of these foundered; and others being forced out to sea, the unhappy passengers were so terrified, that they threw themselves overboard. The day was serene, and not a breath of wind stirring.

At Cadiz, some minutes after nine in the morning, the earthquake began, and lasted about five minutes. The water of the cisterns under ground washed backwards and forwards, so that a great froth arose. At ten minutes after eleven, a wave was seen coming from the sea, at eight miles distance, at least 60 feet higher than usual. It dashed against the west part of the town, which is very rocky. Though these rocks broke a good deal of its force, it at last came upon the city walls, beat in the breast-work, and carried pieces of the building of eight or ten ton weight to the distance of 40 or 50 yards.—When the wave was gone, some parts that are deep at low water, were left quite dry; for the water returned with the same violence with which it came. At half an hour after 11 came a second wave, and after that four other remarkable ones; the first at ten minutes before twelve; the second, half an hour before one; the third, ten minutes after one; and the fourth, ten minutes before two. Similar waves, but smaller, and gradually lessening, continued with uncertain intervals till the evening.

At Gibraltar, the earthquake was not felt till after 14. It began with a tremulous motion of the earth, which lasted about half a minute. Then followed a violent shock; after that, a trembling of the earth for five or six seconds; then another shock not so violent as the first, which went off gradually as it began. The whole lasted about two minutes. Some of the guns on the battery were seen to rise, others to sink, the earth having an undulating motion. Most people were seized with giddiness and sickness, and some fell down; others

Earth-quake.

were stupified; and many that were walking or riding felt no motion in the earth, but were sick. The sea rose six feet every 15 minutes; and then fell so low, that boats and all the small craft near the shore were left aground, and were also numbers of small fish. The flux and reflux lasted till next morning, having decreased gradually from two in the afternoon.

15
At Madrid,
Malaga,
&c.

At Madrid the earthquake came on at the same time as at Gibraltar, and lasted about six minutes. At first every body thought they were seized with a swimming in their heads; and afterwards, that the houses were falling. It was not felt in coaches, nor by those who walked on foot, except very slightly; and no accident happened, except that two lads were killed by the fall of a stone-crofs from the porch of a church.

Malaga (a sea-port on the Mediterranean) felt a violent shock; the bells rung in the steeples; the water of a well overflowed, and as suddenly retired.

Saint Lucar (at the mouth of the Guadalquivir) was violently shocked, and the sea broke in and did a great deal of mischief.

At Seville (16 leagues above the mouth of the Guadalquivir) several houses were shaken down; the famous tower of the cathedral called *La Giralda* opened in the four sides; and the waters were so violently agitated, that all the vessels in the river were driven ashore.

16
At Arzilla
in Africa.

In Africa, the earthquake was felt almost as severely as it had been in Europe. Great part of the town of Algiers was destroyed. At Arzilla (a town in the kingdom of Fez), about ten in the morning, the sea suddenly rose with such impetuosity, that it lifted up a vessel in the bay, and dropped it with such force on the land, that it was broke to pieces; and a boat was found two musket-shot within land from the sea. At Fez and Mequinez, great numbers of houses fell down, and a multitude of people were buried in the ruins.

17
At Morocco.
50.

At Morocco, by the falling down of a great number of houses, many people lost their lives: and about eight leagues from the city the earth opened and swallowed up a village with all the inhabitants, who were known by the name of the *Sons of Bsfumba*, to the number of about 8000 or 10,000 persons, together with all their cattle, &c.; and, soon after, the earth closed again in the same manner as before.

18
At other
places on
the African
coast.

At Salle, a great deal of damage was done. Near a third part of the houses were overthrown; the waters rushed into the city with great rapidity, and left behind them great quantities of fish.

At Tangier, the earthquake began at ten in the morning, and lasted 10 or 12 minutes. The sea came up to the walls (a thing never heard of before); and went down immediately with the same rapidity with which it arose, leaving a great quantity of fish behind it. These commotions were repeated 18 times, and lasted till six in the evening.

At Tetuan, the earthquake began at the same time it did at Tangier, but lasted only seven or eight minutes. There were three shocks so extremely violent, that it was feared the whole city would be destroyed.

19
In the island
of Madeira.

In the city of Funchal, in the island of Madeira, a shock of this earthquake was first perceived at 38 minutes past nine in the morning. It was preceded by a rumbling noise in the air, like that of empty carriages passing hastily over a stone pavement. The observer

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felt the floor immediately to move with a tremulous motion, vibrating very quickly. The shock continued more than a minute; during which space, the vibrations, though continual, were weakened and increased in force twice very sensibly. The increase after the first remission of the shock was the most intense. The noise in the air accompanied the shock during the whole of its continuance, and lasted some seconds after the motion of the earth had ceased; dying away like a peal of distant thunder rolling through the air. At three quarters past eleven, the sea, which was quite calm, it being a fine day, and no wind stirring, retired suddenly some paces; then rising with a great swell without the least noise, and as suddenly advancing, overflowed the shore, and entered the city. It rose 15 feet perpendicular above the high-water mark, although the tide, which flows there seven feet, was then at half ebb. The water immediately receded; and after having fluctuated four or five times between high and low water mark, it subsided, and the sea remained calm as before. In the northern part of the island the inundation was more violent, the sea there retiring above 100 paces at first, and suddenly returning, overflowed the shore, forcing open doors, breaking down the walls of several magazines and storehouses, leaving great quantities of fish ashore and in the streets of the village of Machico. All this was the effect of one rising of the sea, for it never afterwards flowed high enough to reach the high-water mark. It continued, however, to fluctuate here much longer before it subsided than at Funchal; and in some places farther to the westward, it was hardly, if it all, perceptible.

These were the phenomena with which this remarkable earthquake was attended in those places where it was violent. The effects of it, however, reached to an immense distance; and were perceived chiefly by the agitations of the waters, or some slight motion of the earth. The utmost boundaries of this earthquake to the south are unknown; the barbarity of the African nations rendering it impossible to procure any intelligence from them, except where the effects were dreadful. On the north, however, we are assured, that it reached as far as Norway and Sweden. In the former, it in Norway and Sweden. The waters of several rivers and lakes were violently way and agitated. In the latter, shocks were felt in several provinces, and all the rivers and lakes were strongly agitated, especially in Dalecarlia. The river Dala suddenly overflowed its banks, and as suddenly retired. At the same time a lake at the distance of a league from it, and which had no manner of communication with it, bubbled up with great violence. At Fahlun, a town in Dalecarlia, several strong shocks were felt.

20
Effects of
it in Nor-
way and
Sweden.

In many places of Germany the effects of the earthquake were very perceptible. Throughout the duchy of Holstein, the waters were violently agitated, particularly those of the Elbe and Trave. In Brandenburg, the water of a lake called *Lilfer*, ebbed and flowed six times in half an hour, with a dreadful noise, the weather being then perfectly calm. The same agitation was observed in the waters of the lakes called *Mupfegst* and *Netzo*; but at this last place they also emitted an intolerable stench.

21
In Ger-
many.

In Holland, the agitations were more remarkable. In Holland.

At

Earth-
quake.Earth-
quake.

At Alphen on the Rhine between Leyden and Woerden, in the afternoon of the first of November, the waters were agitated to such a violent degree, that buoys were broken from their chains, large vessels snapped their cables, smaller ones were thrown out of the water upon the land, and others lying on land were set afloat. At Amsterdam, about eleven in the forenoon, the air being perfectly calm, the waters were suddenly agitated in their canals, so that several boats broke loose; chandeliers were observed to vibrate in the churches; but no motion of the earth, or concussion of any building, was observed. At Haerlem, in the forenoon, for near four minutes together, not only the water in the rivers, canals, &c. but also all kinds of fluids in smaller quantities, as in coolers, tubs, backs, &c. were surprisingly agitated, and dashed over the sides, though no motion was perceptible in the vessels themselves. In these small quantities also the fluid apparently ascended prior to its turbulent motion; and in many places, even the rivers and canals rose 12 inches perpendicular. At Leyden, between half an hour after 10 and 11 in the forenoon, the waters rose suddenly in some of the canals, and made several very sensible undulations, so that the boats were strongly agitated. The same motion was perceived in the water of the backs of two brew-houses.

Round the island of Corfica, the sea was violently agitated, and most of the rivers of the island overflowed their banks.—In the city of Milan in Italy, and throughout that district, shocks were felt. At Turin in Savoy, there was felt a very violent shock.

In Switzerland, many rivers turned suddenly muddy without rain. The lake of Neuchâtel swelled to the height of near two feet above its natural level for the space of a few hours. An agitation was also perceived in the waters of the lake of Zurich.

At the island of Antigua, there was such a sea without the bar as had not been known in the memory of man; and after it, all the water at the wharfs, which used to be six feet deep, was not two inches.—At Barbadoes, about two in the afternoon, the sea ebbed and flowed in a surprising manner. It ran over the wharfs and streets into the houses, and continued thus ebbing and flowing till ten at night.

The agitation of the waters was perceived in great numbers of places in Great Britain and Ireland.—Accounts of the most remarkable of them follow. At Barborough in Derbyshire, between 11 and 12 in the forenoon, in a boat-house on the west side of a large body of water called *Pibley Dam*, supposed to cover at least 30 acres of land, was heard a surprising and terrible noise; a large swell of water came in a current from the south, and rose two feet on the sloped dam-head at the north end of the water. It then subsided; but returned again immediately, though with less violence. The water was thus agitated for three quarters of an hour; but the current grew every time weaker and weaker, till at last it entirely ceased.

At Busbridge in Surrey, at half an hour after ten in the morning, the weather being remarkably still, without the least wind, in a canal near 700 feet long and 58 feet broad, with a small spring constantly running through it, a very unusual noise was heard at the east end, and the water there observed to be in great agitation. It raised itself in a heap or ridge in the

middle; and this heap extended lengthwise about 30 yards, rising between two or three feet above the usual level. After this, the ridge heeled or vibrated towards the north side of the canal with great force, and flowed above eight feet over the grass walk on that side. On its return back into the canal, it again ridged in the middle, and then heeled with yet greater force to the south side, and flowed over its grass walk. During this latter motion, the bottom on the north side was left dry for several feet. This appearance lasted for about a quarter of an hour, after which the water became smooth and quiet as before. During the whole time, the sand at the bottom was thrown up and mixed with the water; and there was a continual noise like that of water turning a mill.

At Cobham in Surrey, between 10 and 11 o'clock, a person was watering a horse at a pond fed by springs. Whilst the animal was drinking, the water suddenly ran away from him, and moved towards the south with such swiftness, that the bottom of the pond was left bare. It returned again with such impetuosity, that the man leaped backwards to secure himself from its sudden approach. The ducks were alarmed at the first agitation, and instantly flew all out of the pond.

At Dunstall in Suffolk, the water of a pond rose gradually for several minutes in the form of a pyramid, and fell down like a water-spout. Other ponds in the neighbourhood had a smooth flux and reflux from one end to the other.

Near the city of Durham, about half an hour after ten, a gardener was alarmed by a sudden rushing noise from a pond, as if the head of the pond had been broken down: when casting his eye on the water, he saw it gradually rise up, without any fluctuating motion, till it reached a grate which stood some inches higher than the common water level. After this it subsided, and then swelled again; thus continuing to rise and fall during the space of six or seven minutes, making four or five returns in the space of one minute. The pond was about 40 yards long and 10 broad.

At Early Court, Berks, about 11 o'clock, as a gardener was standing by a fish pond, he felt a violent trembling of the earth, which lasted about a minute. Immediately after, he observed a motion of the water from the south to the north end of the pond, leaving the bottom at the south end altogether dry for about six feet. It then returned, and flowed at the south end, rising three feet up the slope bank; and immediately after returned to the north bank, rising there also about three feet. In the time between the flux and reflux, the water swelled up in the middle of the pond, collected in a ridge about 20 inches higher than the level on each side, and boiled like a pot. This agitation from south to north lasted about four minutes.

At Eaton-bridge, Kent, in a pond about an acre in size, a dead calf, and no wind stirring, some persons heard a noise, and imagining something had been tumbling in, ran to see what was the matter. On their arrival at the pond, to their surprise they saw the water open in the middle, so that they could see a post a good way down, almost to the bottom. The water in the mean time dashed up over a bank two feet high, and perpendicular to the pond. This was repeated several times with a great noise.

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quake.

At Eyam-bridge, Derbyshire (in the Peak), the overseer of the lead-mines sitting in his writing-room about 11 o'clock, felt a sudden shock, which very sensibly raised him up in his chair, and caused several pieces of plaster to drop from the sides of the room. The roof was so violently shaken, that he imagined the engine shaft had been falling in. Upon this he immediately ran to see what was the matter, but found every thing in perfect safety.—At this time two miners were employed in carting, or drawing along the drifts of the mines, the ore and other materials to be raised up at the shafts. The drift in which they were working was about 120 yards deep, and the space from one end to the other 50 yards or upwards. The miner at the end of the drift had just loaded his cart, and was drawing it along; but he was suddenly surprised by a shock, which so terrified him, that he immediately quitted his employment, and ran to the west end of the drift to his partner, who was no less terrified than himself. They durst not attempt to climb the shaft, lest that should be running in upon them: but while they were consulting what means they should take for their safety, they were surprised by a second shock more violent than the first; which frightened them so much, that they both ran precipitately to the other end of the drift. They then went down to another miner who worked about 12 yards below them. He told them that the violence of the second shock had been so great, that it caused the rocks to grind upon one another. His account was interrupted by a third shock, which, after an interval of four or five minutes, was succeeded by a fourth; and, about the same space of time after, by a fifth; none of which were so violent as the second. They heard, after every shock, a loud rumbling in the bowels of the earth, which continued about half a minute, gradually decreasing, or seeming to remove to a greater distance.

At Shireburn castle, Oxfordshire, at a little after ten in the morning, a very strange motion was observed in the water of a moat which encompasses the house. There was a pretty thick fog, not a breath of air, and the surface of the water all over the moat as smooth as a looking-glass, except at one corner, where it flowed into the shore, and retired again successfully, in a surprising manner. In what manner it began to move is uncertain, as nobody observed the beginning of its motion. The flux and reflux, when seen, were quite regular. Every flood began gently; its velocity increased by degrees, when at last it rushed in with great impetuosity, till it had attained its full height. Having remained for a little time stationary, it then retired, ebbing gently at first, but afterwards sinking away with great swiftness. At every flux, the whole body of water seemed to be violently thrown against the bank; but neither during the time of the flux nor that of the reflux, did there appear even the least wrinkle of a wave on the other parts of the moat. Lord Viscount Parker, who had observed this motion, being desirous to know whether it was universal over the moat, sent a person to the other corner of it, at the same time that he himself stood about 25 yards from him, to examine whether the water moved there or not. He could perceive no motion there, or hardly any: but another, who went to the north-east corner of the moat, diagonally opposite to his lordship,

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quake.

found it as considerable there as where he was. His lordship imagining, that in all probability the water at the corner diagonally opposite to where he was would sink as that by him rose, he ordered the person to signify by calling out, when the water by him began to sink, and when to rise. This he did; but, to his lordship's great surprise, immediately after the water began to rise at his own end, he heard his voice calling that it began to rise with him also; and in the same manner he heard that it was sinking at his end, soon after he perceived it to sink by himself. A pond just below was agitated in a similar manner; but the risings and sinkings of it happened at different times from those at the pond where lord Parker stood.

At White Rock in Glamorganshire, about two hours ebb of the tide, and near three quarters after six in the evening, a vast quantity of water rushed up with a prodigious noise; floated two large vessels, the least of them above 200 tons; broke their moorings, drove them across the river, and had like to have overtaken them. The whole rise and fall of this extraordinary body of water did not last above ten minutes, nor was it felt in any other part of the river, so that it seemed to have gushed out of the earth at that place.

At Loch Lomond in Scotland, about half an hour ²⁶ after nine in the morning, all of a sudden, without the least

least gust of wind, the water rose against its banks with great rapidity, but immediately subsided, till it was as low in appearance as any body then present had ever seen it in the greatest summer-drought. Instantly it returned towards the shore, and in five minutes time rose again as high as before. The agitation continued at the same rate till 15 minutes after ten the same morning; taking five minutes to rise, and as many to subside. From 15 minutes after 10 till 11, the height of every rise came somewhat short of that immediately preceding, taking five minutes to flow, and as many to ebb, till the water was entirely settled. The greatest perpendicular height of this swell was two feet four inches. A still more remarkable phenomenon attending the earthquake in this lake was, that a large stone lying at some distance from shore, but in such shallow water that it could easily be seen, was forced out of its place in the lake upon dry land, leaving a deep furrow in the ground all along the way in which it had moved.

In Loch Ness, about half an hour after nine, a very great agitation was observed in the water. About ten the river Oich, which runs on the north side of Fort Augustus, into the head of the loch, was observed to swell very much, and run upwards from the loch with a pretty high wave, about two or three feet higher than the ordinary surface. The motion of the wave was against the wind, and it proceeded rapidly for about 200 yards up the river. It then broke on a shallow, and flowed three or four feet on the banks, after which it returned gently to the loch. It continued ebbing and flowing in this manner for about an hour, without any such remarkable waves as the first; but about 11 o'clock, a wave higher than any of the rest came up, and broke with so much force on the low ground on the north side of the river, that it ran upon the grafs upwards of 30 feet from the river's bank.

At Kinfale, between two and three in the afternoon, ²⁷ in Ireland, the weather being very calm, and the tide near full, a large

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large body of water suddenly poured into the harbour with such rapidity, that it broke the cables of two sloops, each moored with two anchors, and of several boats lying between Sicily and the town. But just at the time that a great deal of mischief was apprehended by all the vessels running foul of each other, an eddy whirled them round several times, and then hurried them back again with the same rapidity as before. This was several times repeated; and while the current rushed up at one side of the harbour, it poured down with equal violence at the other. A vessel that lay all this time in the pool did not seem to be any ways affected by it; nor was the violence of the currents much perceived in the deeper parts of the harbour, but raged with most violence on the flats. The bottom of the harbour, which is muddy, was much altered; the mud being washed from some places, and deposited in others. The perpendicular rise of the water at one quay was measured, and found to be five feet and an half; and is said to have been much higher at another, where it overflowed, and poured into the market-place with such rapidity, that some people who were on the quay immediately ran off, and yet could not prevent themselves from being overtaken and immersed knee-deep in the water. The agitations extended several miles up the river; but, as in the harbour, were most perceived in the shallowest places. The successive risings and fallings of the water continued about ten minutes, and then the tide returned to its natural course. Between six and seven in the evening, the water rose again, though not with so great violence as before, and it continued to ebb and flow alternately till three in the morning. The waters did not rise gradually at first; but, with a hollow and horrid noise, rushed in like a deluge, rising six or seven feet in a minute, and as suddenly subsiding. They were as thick as puddle, very black, and stank intolerably.—From different accounts it appeared, that the water was affected in a similar manner all along the coast to the westward of Kinsale.

28
In France.

In France, shocks were perceived in several places; as at Bayonne, Bourdeaux, and Lyons. Commotions of the waters also were observed at Angoulême, Belleville, Havre de Grace, &c. but not attended with the remarkable circumstances above mentioned.

29
Its effects
on springs,
and on the
earth itself.

These are the most striking phenomena with which the earthquake of Nov. 1. 1755 was attended on the surface of the earth. Those which happened below ground cannot be known but by the changes observed in springs, &c. which were in many places very remarkable.—At Colares, on the afternoon of the 31st of October, the water of a fountain was greatly decreased: on the morning of the first of November it ran very muddy; and, after the earthquake, returned to its usual state both as to quantity and clearness. On the hills, numbers of rocks were split; and there were several rents in the ground, but none considerable. In some places where formerly there had been no water, springs burst forth, which continued to run.—Some of the largest mountains in Portugal were impetuously shaken as it were from their foundation; most of them opened at their summits, split and rent in a wonderful manner, and huge masses of them were thrown down into the subjacent valleys.—From the rock called *Pedra de Alvidar*, near the hill Fojo, a kind of parapet

was broken off, which was thrown up from its foundation in the sea.—At Varge, on the river Macaas, at the time of the earthquake, many springs of water burst forth, some spouted to the height of 18 or 20 feet, throwing up sand of various colours, which remained on the ground. A mountainous point, seven or eight leagues from St Ube's, cleft asunder, and threw off several vast masses of rock.—In Barbary, a large hill was rent in two; the two halves fell different ways, and buried two large towns. In another place, a mountain burst open, and a stream issued from it as red as blood. At Tangier, all the fountains were dried up, so that there was no water to be had till night.—A very remarkable change was observed on the medicinal waters of Toplitz, a village in Bohemia famous for its baths. These waters were discovered in the year 762; from which time the principal spring of them had constantly thrown out hot water in the same quantity, and of the same quality. On the morning of the earthquake, between 11 and 12 in the forenoon, the principal spring cast forth such a quantity of water, that in the space of half an hour all the baths ran over. About half an hour before this great increase of the water, the spring flowed turbid and muddy; then having stopped entirely for a minute, it broke forth again with prodigious violence, driving before it a considerable quantity of reddish ochre. After this it became clear, and flowed as pure as before. It still continues to do so; but the water is in greater quantity, and hotter, than before the earthquake. At Angoulême in France, a subterraneous noise like thunder was heard; and presently after the earth opened, and discharged a torrent of water mixed with red sand. Most of the springs in the neighbourhood sunk in such a manner, that for some time they were thought to be quite dry. In Britain, no considerable alteration was observed in the earth, except that, near the lead mine above mentioned in Derbyshire, a cleft was observed about a foot deep, six inches wide, and 150 yards in length.

At sea, the shocks of this earthquake were felt most violently. Off St Lucar, the captain of the Nancy frigate felt his ship so violently shaken, that he thought she had struck the ground; but, on heaving the lead, found he was in a great depth of water. Captain Clark from Denia, in N. Lat. 36. 24. between nine and ten in the morning, had his ship shaken and strained as if she had struck upon a rock, so that the seams of the deck opened, and the compass was overturned in the binnacle. The master of a vessel bound to the American islands, being in N. Lat. 25°, W. Long. 40°, and writing in his cabin, heard a violent noise, as he imagined, in the steerage; and while he was asking what the matter was, the ship was put into a strange agitation, and seemed as if she had been suddenly jerked up and suspended by a rope fastened to the mast-head. He immediately started up with great terror and astonishment; and looking out at the cabin-windows, saw land, as he took it to be, at the distance of about a mile. But, coming upon the deck, the land was no more to be seen, but he perceived a violent current cross the ship's way to the leeward. In about a minute, this current returned with great impetuosity, and at a league's distance he saw three craggy-pointed rocks throwing up water of various colours resembling fire.

30
Effects of
the earth-quake at
sea.

Earth-
quake.

fire. This phenomenon, in about two minutes, ended in a black cloud, which ascended very heavily. After it had risen above the horizon, no rocks were to be seen; though the cloud, still ascending, was long visible, the weather being extremely clear.—Between nine and ten in the morning, another ship, 40 leagues west of St Vincent, was so strongly agitated, that the anchors, which were lashed, bounced up, and the men were thrown a foot and a half perpendicularly up from the deck. Immediately after this, the ship sunk in the water as low as the main chains. The lead showed a great depth of water, and the line was tinged of a yellow colour and smelt of sulphur. The shock lasted about ten minutes, but they felt smaller ones for the space of 24 hours.

§1
Of the
earthquakes
in Calabria
in 1783.

§2
Sir Wil-
liam Ha-
milton's
account of
their ex-
tent.

Such were the phenomena of this very remarkable and destructive earthquake, which extended over a tract of at least four millions of square miles. The earthquakes, however, which in the year 1783 ruined a great part of Italy and Sicily, tho' much more confined in their extent, seem to have been not at all inferior in violence. Sir William Hamilton, who wrote a particular account of their effects, informs us, that "if, on a map of Italy, and with your compass on the scale of Italian miles you were to measure off 22, and then, fixing the central point in the city of Oppido (which seemed to be the spot where the earthquake had exerted its greatest force) form a circle (the radii of which will be 22 miles), you will then include all the towns, villages, &c. that have been utterly ruined, and the spots where the greatest mortality happened, and where there have been the most visible alterations on the face of the earth: then extend your compass on the same scale to 72 miles, preserving the same centre, and form another circle, you will include the whole country that has any mark of having been affected by the earthquake. A gradation was plainly observed in the damage done to the buildings, as also in the degree of mortality, in proportion as the countries were more or less distant from this supposed centre of the evil." Another circumstance was particularly remarked, and in which this earthquake differed very considerably from others, viz. that if two towns were situated at an equal distance from this centre, one on the hill, the other on the plain or in a bottom, the latter always suffered more by the shocks of the earthquakes than the former.

§3
General
account of
their ef-
fects.

From the most authentic reports and accounts received by his Sicilian majesty's secretary of state, it was learned, that the part of Calabria which had been most affected by this heavy calamity, is that comprehended between the 38th and 39th degree of latitude: that the greatest force of the earthquake seemed to have exerted itself from the foot of those mountains of the Apennines called the Monte Dijo, Monte Sacro, and Monte Caulene, extending westward to the Tyrrhene sea: that the towns, villages, and farm-houses nearest these mountains, situated either on the hills or the plain, were totally ruined by the shock of the 5th of February about noon: that as the towns and villages were at a greater distance from this centre, the damage they received was less considerable; but that even these more distant towns had been greatly damaged by the subsequent shocks of the earthquakes, and effectually by those of the 7th, 26th, and 28th of February, and that of the

N^o 107.

Earth-
quake.

1st of March; that from the first shock of the 5th of February, the earth had been in a continual tremor; and that the shocks were more sensibly felt at times in some parts of the afflicted provinces than at others; that the motion of the earth had been either whirling like a vortex, horizontal, or by pulsations, or by beatings from the bottom upwards. This variety of motions increased the apprehensions of the miserable inhabitants, who expected every moment that the earth would open under their feet, and swallow them up. It was said also that the rains had been continued and violent, frequently accompanied with irregular and furious gusts of wind; and that from all these causes, the face of that part of Calabria comprehended between the 38th and 39th degrees was entirely altered, particularly on the western side of the mountains above mentioned: that many openings and cracks had been made in those parts; some hills had been much lowered, and others entirely swallowed up; deep chasms had been made, by which many roads were rendered impassable; huge mountains were said to have been split asunder, and the parts of them driven to a considerable distance; deep valleys to have been filled up by the concourse of the mountains which formed them before; the course of rivers altered; many springs of water dried up, and new ones formed in their place, &c. A singular phenomenon was said to have been observed at Laureana in Calabria Ultra; viz. that two whole tenements, with large plantations of olive and mulberry trees, situated in a valley perfectly level, had been detached by the earthquake, and transplanted, with the trees still remaining in their places, to the distance of about a mile from their first situations; and that from the spot on which they formerly stood, hot water had sprung up to a considerable height, mixed with sand of a ferruginous nature: that near this place also some countrymen and shepherds had been swallowed up, with their teams of oxen, and their flocks of goats and sheep. The number of lives lost was estimated at 32,367; but Sir William Hamilton is of opinion, that, including strangers, it could not be less than 40,000.

The fate of the inhabitants of Scilla was extremely affecting. On the first shock of the earthquake February 5th, they had fled along with their prince to the sea-shore, where they hoped for safety; but in the night-time a furious wave (said to have been boiling hot, and by which many people were alleged to have been scalded) overflowed the land for three miles, sweeping off in its return 2473 of the inhabitants, among whom was the prince himself, who were at that time either on the strand or in boats near the shore. But the most singular of all the phenomena enumerated in these accounts was, that a hill, about 500 palms in height, and 1300 in circumference at its basis, jumped to the distance of about four miles from the place where it formerly stood. At the same time the hill on which the town of Oppido stood, which extended about three miles, parted in two; and as its situation was between two rivers, both of these were of course flooded up; two great lakes were formed, and by their continual increase threatened to infect the air by their noxious exhalations.

Such were the accounts at first propagated and universally believed; but Sir William Hamilton, who made a tour through the ruined country that same year, found

§4
Fate of the
inhabitants
of Scilla.

§5
A hill re-
moves from
its place.

§6
Authenti-
city of these
accounts
examined
by Sir Wil-
liam Ha-
milton.

Earth-quake.

Earth-quake.

40
Left with less than on the plain.

found that, though the effects in general were very dreadful, still there had been some exaggeration in several particulars. He set sail, for the purpose of making this tour, on the 2d of May, for Naples, and soon landed on the coast of Calabria Citra. The first appearances of the earthquake were observed at Cetraro; some of the principal inhabitants of that city having quitted their habitations, though Sir William could not perceive that any damage had been done. At St Lucido, the baron's palace and the church steeple had suffered, and most of the inhabitants were in barracks; but wishing to come as soon as possible to the centre of that scene of desolation, he set sail again, and landed on the 6th of May at the town of Pizzo in Calabria Ultra. This town is situated on a volcanic tufa, and had been greatly damaged by the earthquake of February 5th, but completely ruined by that of the 28th of March. Here he was assured, that the volcano of Stromboli, which is opposite, and in full view of the town, though distant about 50 miles, had smoked less and thrown up a smaller quantity of inflamed matter during the earthquakes than it had done for some years before; and that slight shocks still continued to be felt. Sir William had soon a convincing proof that this last information was true; for, sleeping that night in his boat, (called a *Maltese Speronara*), he was awakened with a smart shock, which seemed to lift up the bottom of the boat, but was not attended with any subterranean noise.

From Pizzo he passed through a most beautiful country to Monteleone. This town, anciently called *Vila Valentia*, is finely situated on a hill, overlooking the sea and the fine rich plains through which he had just passed; which are bounded by the Apennines, and crowned by Alpramonte the highest of them all. They were formerly interspersed with towns and villages; but at that time all of them lay in ruins. Monteleone suffered little on the 5th of February, but was greatly damaged on the 28th of March. Here every one agreed, that the shocks of the earthquake seemed to come with a rumbling noise from the westward; beginning usually with the horizontal motion, and ending with the verticose, by which last the greatest part of the buildings in this province were destroyed. It was a general observation also, that before a shock the clouds seemed to be fill and motionless, and that immediately after a heavy shower of rain a shock quickly followed. Here Sir William had an opportunity of seeing many people who had been thrown down by the violence of the shocks. Several peasants told him, that the motion of the earth was so violent, that the heads of the largest trees almost touched the ground from side to side; that during a shock, the horses and oxen extended their legs wide asunder, that they might not be thrown down; and that they gave evident signs of being sensible of the approach of each shock. "I myself (says he) have observed, that in those parts which have suffered most by earthquakes, the braying of an ass, the neighing of a horse, or the cackling of a goose, always drove people out of their barracks, and was the occasion of many Pater-nosters and Ave-marias being repeated, in expectation of a shock."

From Monteleone our author descended into the plain, having passed through many towns and villages

which had been more or less ruined according to their vicinity to the plain. The town of Mileto, standing in a bottom, was totally ruined, not a house being left standing. At some distance he saw Soriano, and the noble Dominican convent, a heap of ruins. In this on the high day's journey, he observes, that all habitations situated upon high grounds, the soil of which is a gritty sandstone, somewhat like a granite, but without the confidence, had suffered less than those situated on the plain; the latter being universally levelled with the ground. The soil of the plain is a sandy clay, white, red, and brown; but the white prevails most, and is full of marine shells, particularly scallops. It is intersected in many parts by rivers and torrents, which have produced wide and deep ravines all over the country. Passing through the ruined town of St Pietro, in his way to Rosarno, our author had a distant view of Sicily and the summit of Mount Etna, which then sent forth a considerable smoke. Just before his arrival at Rosarno, he passed over a swampy plain, in many parts of which he was shown small hollows in the earth, of the shape of an inverted cone. They were covered with sand, as was the soil near them. He was informed, that during the earthquake of the 5th of February, a fountain of water, mixed with sand, had been driven up from each of these spots to a considerable height. Here he spoke to a peasant who had been an eye-witness, and was even covered with the water and sand; but he assured him, that it was not hot, as had been represented. Before this appearance, he said, the river was dry; but soon after returned and overflowed its banks. He afterwards found, that the same phenomenon had been constant with respect to all other rivers in the plain, during the dreadful shock of the 5th of February. This phenomenon, our author thinks, may be easily explained by supposing the first impulse of the earthquake to have come from the bottom upwards, which all the inhabitants of the plain attested to be fact; the surface of the plain suddenly rising, the rivers, which are not deep, would naturally disappear, and the plain returning with violence to its former level, the rivers must naturally have returned and overflowed, as the sudden depression of the boggy grounds would as naturally force out the water that lay hid under their surface. It was observed in the other parts where this phenomenon had been exhibited, that the ground was always low and rushy. Between this place and Rosarno they passed the river Messano or Metauro (which is near the town above mentioned) on a bridge of strong timber-bridge, 700 palms long, lately built by the duke of Monteleone. From the cracks made in the banks and in the bed of the river by the earthquake, it was quite separated in one part; and the level on which the piers were placed having been variously altered, the bridge had taken an undulated form, so that the rail on each side was curiously scolloped; but the separated parts having been joined again, it was then passable. Our author was also informed, that at the time of the earthquake the river was perfectly dry for some seconds, and then returned with violence and overflowed; and that the bridge undulated in a most extraordinary manner. By the earthquake in the plain, our author undertands the shock of the 5th of February, which did so much damage without giving any previous notice.

M m

The

37
Left smoke than usual emitted by Stromboli during the earthquakes.

41
Conical opening made in the earth, which spouts up water during the shock.

42
The rivers dried up for a short time.

43
This phenomenon accounted for.

44
Appearance of a bridge on the Metauro.

38
Manner in which the shocks came at Monteleone.

39
Their extensive violence.

Earth-quake.

The town of Rosarno, with the duke of Monteleone's palace there, was entirely ruined; but the walls remained about six feet high, and were at that time fitting up as barracks. The only building that remained unharmed at Rosarno was the town gaol, in which were three notorious villains, who would probably have lost their lives if they had remained at liberty.

45
Explanation of the change of place of two tenements of land,

From Rosarno Sir William proceeded to Laureana, where he was conducted to the place where two tenements were said to have exchanged situations. This fact, which at the first relation appeared so incredible, Sir William assures us was true, and very easily accounted for. These tenements were situated in a valley surrounded by high grounds; and the surface of the earth, which was removed, had probably been undermined by little rivulets which come from the mountains, and were then plainly discernible on the bare spot which the tenements had quitted. Their course down the valley was sufficiently rapid to prove that it had not been a perfect level as was represented. The earthquake, he supposes, had opened some depositories of rain-water in the clay-hills which surround the valley; which water, mixed with the loose soil, taking its course suddenly through the undermined surface, lifting it up with the large olive and mulberry trees, and a thatched cottage, floated the whole piece of ground, with all its vegetation, about a mile down the valley, where it then stood with most of the trees erect. These two tenements were about a mile long and half a mile broad. In the neighbourhood were several cracks, none of them above a foot wide; but our author was assured, that during the earthquake they had opened wide, and swallowed up an ox with near 100 goats. In the above mentioned valley he saw the same sort of hollows in the form of inverted cones, out of which he had been assured that hot water mixed with sand issued during the earthquakes as at Rosarno; but, on proper inquiry, no person was found who could positively declare that the water had really been hot. Some of the sand which was thrown up had a ferruginous appearance, and seemed to have been acted upon by fire. It was said also, that when fresh, this sand had the smell of sulphur; but this our author could not perceive.

46
Cracks in the earth opened wide during the earthquake, and afterwards closed.

47
No hot water thrown up by the earth.

48
All the inhabitants of several towns buried in an instant in the ruins of their houses.

49
Houses of Casal Nuova lifted at once from their foundation.

Passing through the fine beautiful country to the town of Polistene, he did not perceive a single house standing. "I travelled (says he) four days in the plain, in the midst of such misery as cannot be described. The force of the earthquake there was so great, that all the inhabitants of the towns were buried, alive or dead, in the ruins of their houses in an instant. The town of Polistene was large, but ill situated between two rivers that were subject to overflow. Two thousand one hundred, out of 6000, lost their lives here on the fatal 5th of February." At Casal Nuova, the prince's Gerace Grimaldi, with 4000 of her subjects, perished on the same day by the explosion; for such it appears to have been. Some who had been dug alive out of the ruins, told our author, that they had felt their houses fairly lifted up, without having the least previous notice. An inhabitant of Casal Nuova was at that moment on a hill overlooking the plain; when, feeling the shock, and turning round, instead of the town he saw only a thick cloud

of white dust like smoke, the natural effect of the crushing of the buildings and the mortar flying off.

The town of Casal Nuova was so effectually destroyed by this dreadful shock, that neither vestige of house or street remained, but all lay in one confused heap of ruins. Castilease and Milicucio, which our author next visited, were both in the same situation. Terra Nuova, situated in the same plain, stood between two rivers, which, with the torrents from the mountains, had, in the course of ages, cut deep and wide chasms in the soft sandy clay soil of which it is composed. At Terra Nuova the ravine or chasm is not less than 500 feet deep, and three quarters of a mile broad. Here the accounts of the earthquake were confused, by not having the situation of the place and nature of the soil explained. It was said, that a town Terra Nuova had been thrown a mile from the place on which it stood, without mentioning a word of the ravine; that woods and corn-fields had been removed in the same manner, "when in truth (says our author) it was but upon a large scale, what we see every day upon a smaller; when pieces of the sides of hollow ways, having been undermined by rain waters, are detached by their own weight. Here, from the great depth of the ravine, and the violent motion of the earth, two huge portions of the latter, on which a great part of the town stood, which consisted of some hundred houses, had been detached into the ravine, and nearly across it, at about the distance of half a mile from the place where they formerly stood; and what is very extraordinary, many of the inhabitants who had taken this singular leap in their houses, were nevertheless dug out alive, and some unhurt." Our author's guide there, who was both a priest and physician, having been buried in the ruins of his house by the first shock, was blown out of it and delivered by the second, which immediately followed the first; and there were many well attested instances of the same thing having happened in different parts of Calabria. At Terra Nuova, however, only 400 out of 1600 inhabitants were left alive.

Earth-quake.

50
Removal of part of the town of Terra Nuova explained.

51
Extraordinary escape of some of the inhabitants.

In other parts of the plain, situated near the ravine, and near the town of Terra Nuova, our author saw tracts of many acres of land, with trees and corn-fields, that had been detached into the ravine, frequently without having been overturned; so that the crops were growing as well as if they had been planted there. Other such pieces were lying in the bottom in an inclined situation; and others again that had been quite overturned. In one place, two of these immense pieces of land having been detached, opposite to one another, had filled the valley, and stopped the course of the river, the waters of which were forming a great lake; "and this (says our author) is the true state of what the accounts mention of mountains that had walked, and joined together, stopped the course of a river, and formed a lake."

52
Great tracts of land moved from their places.

At the moment of the earthquake the river disappeared as at Rosarno; and returning soon after, overflowed the bottom of the ravine about three feet in depth; so that the poor people who had been thrown with their houses into the ravine from the top of it, and had escaped with broken bones, were now in danger of being drowned. Our author was assured, that the water was salt like that of the sea; but this circumstance

Earth-quake.

cumstance seemed to want confirmation. The same cause, however, given for the sudden disappearing of the river Metauro at Rosarno will account for the like phenomenon here, and in every part of the country where the rivers were dried up at the moment of the earthquake.

The whole town of Molochi di Sotto was likewise detached into the ravine, and a vineyard of many acres lay near it in the bottom in perfect order, but in an inclined situation. There was a foot-path through this vineyard which had a singular effect in its then impracticable situation. Some water-mills which were on the river, being jammed between two such detached pieces as above described, were lifted up by them, and were then to be seen on an elevated situation many feet above the level of the river.

In several parts of the plain, the soil, with timber-trees and crops of corn, consisting of many acres, had sunk eight and ten feet below the level of the plain, and risen as many in other places. To explain this, it is necessary to remember, that the soil of the plain is a clay mixed with sand, which is easily moulded into any shape. In the plain, near the spots where the above mentioned pieces had been detached into the ravine, there were several parallel cracks; so that, had the violence of the earthquake continued, these pieces would also probably have followed. It was constantly remarked by our author, that near every ravine or hollow way, the parts of the plain adjoining were full of large parallel cracks. The earth rocking from side to side, and being supported only on one side, accounts very well for this circumstance.

From Terra Nuova our author continued his journey to Oppido. This city stands on a mountain of a ferruginous sort of gritty stone, unlike the clay soil of its neighbourhood: and is surrounded by two rivers in a ravine deeper and broader than that at Terra Nuova. Instead of the mountain on which this city stands having split, as was reported, and by its fall stopped up the course of rivers, it was, as at Terra Nuova, huge pieces of the plain on the edge of the ravine, that had been detached into it, had nearly filled it up, and stopped the course of the rivers, the waters of which were then forming two great lakes. Part of the rock on which the city stood was indeed also detached, with several houses, into the ravine: "But that (says our author) is a trifling circumstance in comparison of the very great tracts of land with plantations of vines and olives which had been detached from one side of the ravine to the other, though the distance is more than half a mile. It is well attested, that a countryman, who was ploughing his field in this neighbourhood with a pair of oxen, was transported with his field and team clear, from one side of a ravine to the other, and that neither he nor his oxen were hurt.

"Having walked over the ruins of Oppido (says our author), I descended into the ravine, and examined carefully the whole of it. Here I saw indeed the wonderful force of the earthquake, which has produced exactly the same effects as those described in the ravine at Terra Nuova, but on a scale infinitely greater. The enormous masses of the plain, detached from each side of the ravine, lie sometimes in confused heaps, forming real mountains, and having stopped

the course of two rivers (one of which is very considerable); great lakes are already formed; and if not assisted by nature or art, so as to give the rivers their due course, must infallibly be the cause of a general infection in the neighbourhood. Sometimes I met with a detached piece of the surface of the plain (of many acres in extent) with the large oaks and olive-trees, with corn or lupins under them, growing as well and in as good order at the bottom of the ravine as their companions from whence they were separated do on their native soil, at least 500 feet higher, and at the distance of about three quarters of a mile. I met with whole vineyards in the same order in the bottom that had likewise taken the same journey. As the banks of the ravine from whence these pieces came are now bare and perpendicular, I perceived that the upper soil was a reddish earth, and the under one a sandy white clay, very compact, and like a soft stone. The impulse these huge masses received, either from the violent motion of the earth alone, or that assisted with the additional one of the volcanic exhalations set at liberty, seems to have acted with greater force on the lower and more compact stratum than on the upper cultivated crust: for I constantly observed, where these cultivated lands lay, the under stratum of compact clay had been driven some hundred yards farther, and lay in confused blocks; and, as I observed, many of these blocks were in a cubical form. The under soil, having had a greater impulse, and leaving the upper in its slight, naturally accounts for the order in which the trees, vineyards, and vegetation fell, and remain at present in the bottom of the ravine.

"In another part of the bottom of the ravine there is a mountain composed of the same clay soil, and which was probably a piece of the plain detached by an earthquake at some former period: it is about 250 feet high, and 400 feet diameter at its basis. This mountain, as is well attested, has travelled down the ravine near four miles; having been put in motion by the earthquake of the 5th of February. The abundance of rain which fell at that time, the great weight of the fresh detached pieces of the plain which I saw heaped up at the back of it, the nature of the soil of which it is composed, and particularly its situation on a declivity, accounts well for this phenomenon; whereas the reports which came to Naples of a mountain having leaped four miles, had rather the appearance of a miracle. I found some single timber-trees also with a lump of their native soil at their roots, standing upright in the bottom of the ravine, and which had been detached from the bottom of the plain above mentioned. I observed also, that many confused heaps of the loose soil, detached by the earthquake from the plains, on each side of the ravine, had actually run like a volcanic lava (having probably been assisted by the heavy rain), and produced many effects much resembling those of lava during their course down a great part of the ravine. At Santa Cistina, near Oppido, the like phenomena have been exhibited, and the great force of the earthquake of the 5th of February seems to have been exerted on these parts, and at Casal Nuova, and Terra Nuova."

From Oppido Sir William proceeded to the towns of Seminara and Palmi. The former, being situated

Earth-quake.

53
Water-mills raised up to an elevated situation.

54
Rising of the ground in some places, and sinking in others, explained.

55
Cracks in the earth, why generally termed near ravines.

56
Splitting of the mountain at Oppido explained.

57
A countryman detached with a great tract of land across a ravine.

58
Mountains and lakes formed by the earthquake.

59
Observations on the soil of the detached tracts of land, and the effects of the shock upon them.

60
Removal of the hill accounted for.

61
Some parts of the soil run like a volcanic lava.

Earthquake.

62
A singular circumstance of a rivulet of oil by the breaking of the vessels in Palmi.

higher up, had suffered less than Palmi which stood nearer the sea. Fourteen hundred lives were lost at this place, and some singular circumstances occurred. The town being a great market for oil, there were upwards of 4000 barrels of that liquid in it at the time of its destruction; so that by the breaking of these barrels and jars, a rivulet of oil ran from the ruins for many hours into the sea. Here our author was informed by the person who conducted him, that he had been buried in the ruins of his house by the first shock; and that after the second, which followed immediately, he found himself sitting astride a beam at least 15 feet high in the air. After Sir William's departure from Palmi, in going through one of the narrow passes among the mountains of Bagnara and Solano, he felt a very smart shock of an earthquake attended with a loud explosion like that of springing a mine; but fortunately it did not detach any rocks or trees from the high mountains which hung over their heads. In this country he was assured by several fishermen, that during the earthquake on the 5th of February, at night, the sea was hot, and that they saw fire issue from the earth in many parts. This last circumstance was frequently repeated in different parts of the plain, so that there seems to remain no doubt of its authenticity. The idea of Sir William Hamilton is, that "the exhalations which issued during the violent commotions of the earth were full of electrical fire; just as the smoke of volcanoes constantly is during violent eruptions: for I saw no mark (says he), in any part of my journey, of any volcanic matter having issued from the fissures of the earth; and I am convinced that the whole has been done by vapours and exhalations only. The first shock felt at this place, as I was assured, was lateral, and then vorticeose, and exceedingly violent; but what they call violent here must have been nothing in comparison of what was felt in the plain of Casa Nuova, Polistene, Palmi, Terra Nuova, Oppido, &c. &c. where all agreed that the violence of the fatal shock of February was instantaneous, without warning, and from the bottom upwards."

At Reggio the shock had been much less violent than in the places hitherto visited by our author; and "though there was not a house in it inhabited or habitable, yet (says he) after having been several days in the plain, where every building is levelled with the ground, a house with a roof, or a church with a steeple, was to me a new and refreshing object." In this place he had an account from the archbishop of the earthquakes of 1770 and 1780, which obliged the inhabitants, in number 16,400, to encamp or remain in barracks for several months, without having done any considerable damage to the town. He was informed also, that all animals and birds are in a greater or lesser degree much more sensible of an approaching shock of an earthquake than any human being; but that geese, above all, seem to be the soonest and most alarmed at the approach of a shock: if in the water, they quit it immediately; and there are no means of driving them into it for some time after. The shock which damaged Reggio came on gently, so that the people had time to make their escape, and only 126 were killed; but in the plain this shock was as instantaneous as it was violent and destructive.

On the 14th of May, Sir William Hamilton having

taken leave of Reggio, set sail for Messina, which he visited next morning; and found that the shock, tho' very violent there, had been far inferior to what he had seen the effects of in other places. Many houses, even in the lower part of the town, were standing, and some little damaged; but in the upper and more elevated situations, the earthquakes seemed to have scarce had any effect. "A strong instance (says our author) of this is, that the convent of Santa Barbara, and that called the *Noviziato de Gesuiti*, both on an elevated situation, have not a crack in them; and that the clock of the latter has not been deranged in the least by the earthquakes, which have afflicted this country for four months past, and which still continue in some degree."

Notwithstanding this comparative mildness, however, the shock at Messina had been very terrible. All the beautiful front of the palazzate, which extended in very lofty uniform buildings, in the shape of a crescent, had been in some parts totally ruined, in others less; and there were cracks in the earth of the quay, a part of which had sunk above a foot below the level of the sea. These cracks were probably occasioned by the horizontal motion of the earth in the same manner as the pieces of the plain were detached into the ravines at Oppido and Terra Nuova; for the sea at the edge of the quay is so very deep, that the largest ships can lie along side. The earth, therefore, in its violent commotion, wanting support on that side next the sea, began to crack and separate; and as where there is one crack there are generally others less considerable in lines parallel to the first, our author supposes, that the great damage done to the houses near the quay was owing to such cracks below their foundations. It is said, that during the earthquake fire had been seen to issue from the cracks of the quay; but our author is persuaded that this, as in other cases, was only a vapour charged with electrical fire or a kind of inflammable air. Here also he was informed, that the shock of the 5th of February had been from the bottom upwards; but the subsequent ones generally horizontal or vorticeose. A remarkable circumstance was observed at Messina, and through the whole coast of Calabria, which had been most affected by the earthquake, viz. that a small fish called *cicirelli*, resembling the English white bait, but larger, and which usually lie at the bottom of the sea buried in the sand, had, ever after the commencement of the earthquakes to the time this account was written, continued to be taken near the surface, and that in such abundance as to be common food for the poorest sort of people; whereas before the earthquakes this fish was rare, and reckoned among the greatest delicacies. Fish of all kinds also were taken in greater abundance on these coasts after the commencement of the earthquakes than before; which our author supposes to have been occasioned either by the volcanic matter having heated the bottom of the sea, or that the continual tremor of the earth had forced them out of their retreats. At Messina our author was likewise informed, that on the 5th of February, and for three days following, the sea about a quarter of a mile from the tadel rose and boiled in an extraordinary manner, and with a most horrid and alarming noise; the water in

Earthquake.

66
Earthquake less violent at Messina than in Italy.

67
Effects of it there.

68
Remarkable circumstance respecting a kind of small fishes.

69
Extraordinary boiling of the sea near Messina.

(says.

63
A shock with an explosion felt by Sir William Hamilton.

64
Fire issuing from the earth supposed to be electric.

65
Brute animals sensible of the approach of earthquakes.

Earthquake.

Earthquake.

(says our author) seems to point out exhalations or eruptions from cracks at the bottom of the sea, which may very probably have happened during the violence of the earthquakes; all of which I am convinced have here a volcanic origin."

70
Account of the great wave which destroyed the inhabitants of Scilla.

The next inquiry made by this curious traveller was concerning the great wave which occasioned such destruction at Scilla, as has already been related. Having left Messina on the 17th of May, he proceeded in his boat to the entrance of the Faro, where he met with a priest who had been there on the night between the 5th and 6th of February, when the wave passed over that point of land. Here it carried off boats with 24 people, tore up trees by the roots, and left a considerable quantity of fish behind it. This priest had himself been covered by the wave, and with difficulty saved his life. He at first said the water was hot; but on being pressed with other questions, it amounted to no more than that the water was as warm as it usually is in summer. The wave, he said, rose to a great height, and came on with noise and such rapidity that it was impossible to escape.

71
The water was not hot as had been reported.

On crossing over to Scilla, Sir William was perfectly satisfied concerning the nature of this formidable wave, and found that the following was the true state of the fact: "The prince of Scilla having remarked, that during the first horrid shock, which happened about noon the 5th of February, part of a rock near Scilla had been detached into the sea; and fearing that the rock of Scilla, on which his town and castle are situated, might also be detached, he thought it safer to prepare boats, and retire to a little port or beach seated at the foot of it, and likewise surrounded by rocks. But the second shock of the earthquake about midnight, having detached a whole mountain much higher than that of Scilla, situated between the latter and Torre del Cavallo, it fell into the sea with such violence as to raise the fatal wave above mentioned. This having broken on the point of land called *Punto del Faro*, in the manner already related, instantly returned with great noise and celerity upon the beach, where the unfortunate prince and his subjects had taken refuge, and either dashed them with their boats and effects against the rocks, or whirled them into the sea. Those who had escaped the first and greatest wave, were carried off by a second and third less considerable, but which immediately followed the first. Our author spoke with many who had been involved in that wave, and violently hurt by it; but all of them agreed in asserting that the water was not hot.

73
Conjecture concerning a volcanic explosion in the bottom of the sea.

The earthquakes were not perfectly settled even in 1784, when Sir William Hamilton wrote the account of the state of Vesuvius, &c. to the Royal Society. In a postscript to that letter he adds the following confirmation of his conjecture, that the volcanic matter, which he supposed to have occasioned the earthquakes, had vented itself at the bottom of the sea betwixt Calabria and Sicily. "The pilot of one of his Sicilian majesty's sciabecques having some time after the earthquakes cast anchor off the point of Palizzi, where he had often anchored in 25 fathom water, found no bottom till he came to 65; and having sounded for two miles out at sea towards the point of Spartivento in Calabria, he still found the

same considerable alteration in the depth. The inhabitants of Palizzi likewise declare, that during the great earthquake on the 5th of February 1783, the sea had boiled and frothed up tremendously off their point."

To explain the phenomena of earthquakes, various hypotheses have been invented. Till lately, the hypotheses of modern philosophers were much the same with those of the ancients. Anaxagoras supposed the cause of earthquakes to be subterraneous clouds bursting out into lightning, which shook the vaults that confined them. Others imagined, that the arches, which had been weakened by continual subterraneous fires, at length fell in. Others derived these accidents from the rarefied steam of waters, heated by some neighbouring fires; and some, among whom was Epicurus, and several of the Peripatetic school, ascribed these terrible accidents to the ignition of certain inflammable exhalations.

74
Hypotheses concerning the cause of earthquakes.

This last hypothesis has been adopted by many of the most celebrated moderns, as Gassendus, Kircher, Schottus, Varenus, Des Cartes, Du Hamel, Honorius, Fabri, &c. The philosopher last mentioned indeed supposed, that waters prodigiously rarefied by heat might sometimes occasion earthquakes. The others supposed, as their hypothesis necessarily requires, that there are many and vast cavities underground which have a communication with one another: some of which abound with waters; others with vapours and exhalations, arising from inflammable substances, as nitre, bitumen, sulphur, &c. These combustible exhalations they supposed to be kindled by a subterraneous spark, or by some active flame gliding through a narrow fissure from without, or by the fermentation of some mixture; and when this happened, they must necessarily produce pulses, tremors, and ruptures at the surface, according to the number and diversity of the cavities, and the quantity and activity of the inflammable matter. This hypothesis is illustrated by a variety of experiments, such as mixtures of iron-filings and brimstone buried in the earth, gun-powder confined in pits, &c. by all which a shaking of the earth will be produced.

Dr Woodward suggests another hypothesis. He⁷⁵ supposes that the subterraneous heat or fire, which is continually elevating water out of the abyss, which, according to him, occupies the centre of the earth, to furnish rain, dew, springs, and rivers, may be stopped in some particular part. When this obstruction happens, the heat causes a great swelling and commotion in the waters of the abyss; and at the same time, making the like effort against the superincumbent earth, that agitation and concussion of it is occasioned which we call an earthquake.

75
Of Dr Woodward's hypothesis.

Mr Amontons of the Royal Academy of Sciences⁷⁶ suggests an hypothesis entirely different from any of the above mentioned ones. According to the received philosophical principles, which suppose the atmosphere to be about 45 miles high, and that the density of the air increases in proportion to the absolute height of the superincumbent column of fluid; it is shown, that at the depth of 43,528 fathoms below the surface of the earth, air is but one-fourth lighter than mercury. Now, this depth of 43,528 fathoms is only

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Earth-quake.

only a 74th part of the fensidiameter of the earth; and the vast sphere beyond this depth, in diameter 6,451,538 fathoms, may probably be only filled with air; which will be here greatly condensed, and much heavier than the heaviest bodies we know of in nature. But it is found by experiment, that the more air is compressed, the more does the same degree of heat increase its spring, and the more capable does it render it of a violent effect; and that, for instance, the degree of heat of boiling water increases the spring of the air above what it has in its natural state, in our climate, by a quantity equal to a third of the weight wherewith it is pressed. Whence we may conclude, that a degree of heat, which on the surface of the earth will only have a moderate effect, may be capable of a very violent one below. And as we are assured, that there are in nature degrees of heat much more considerable than that of boiling water, it is very possible there may be some, whose violence, further assisted by the exceeding weight of the air, may be more than sufficient to break and overturn this solid orb of 43,528 fathoms; whose weight, compared to that of the included air, would be but a trifle.

77
All these
hypotheses
rejected by
Dr Stuke-
ly.

Though none of these hypotheses were sufficient for explaining the phenomena of earthquakes in a satisfactory manner, one or other of them continued to be adopted by almost all philosophers till the year 1749. In the month of March that year, an earthquake was felt at London and several other places in Britain. Dr Stukeley, who had been much engaged in electrical experiments, began to suspect that phenomena of this kind ought to be attributed not to vapours or fermentations generated in the bowels of the earth, but to electricity. In a paper published by him on this subject, he rejects all the above mentioned hypotheses for the following reasons.

1. That there is no evidence of any remarkable cavernous structure of the earth; but that, on the contrary, there is rather reason to presume that it is in a great measure solid, so as to leave little room for internal changes and fermentations within its substance; nor do coal-pits, he says, when on fire, ever produce any thing resembling an earthquake.

2. In the earthquake at London, in March 1749, there was no such thing as fire, vapour, smoke, smell, or an eruption of any kind observed, though the shock affected a circuit of 30 miles in diameter. This consideration alone of the extent of surface shaken by an earthquake, he thought sufficient to overthrow the supposition of its being owing to the expansion of any subterraneous vapours. For as small fire-balls bursting in the air propagate a sulphureous smell to the distance of several miles, it cannot be supposed, that so immense a force acting instantaneously on that compass of ground should never break the surface of it, nor become discoverable either to the sight or the smell; besides, that the operation of such a fermentation would be many days in continuance, and the evaporation of so much inflammable matter would require a long space of time. That such an effect, therefore, should be produced instantaneously, can be accounted for by electricity only; which acknowledges no sensible transition of time, no bounds.

3. If vapours and subterraneous fermentations, ex-

plosions and eruptions, were the cause of earthquakes, they would absolutely ruin the whole system of springs and fountains, wherever they had once been; which is contrary to fact, even when they have been frequently repeated. Even in the earthquake in Asia Minor, A. D. 17, which destroyed 13 great cities, and shook a mass of earth 300 miles in diameter, nothing suffered but the cities; neither the springs nor the face of the country being injured, which indeed remains the same to this day.

4. That any subterraneous power sufficient to move 30 miles in diameter, as in the earthquake which happened at London, must be lodged at least 15 or 20 miles below the surface; and therefore must move an inverted cone of solid earth, the base of which is 30 miles in diameter, and the axis 15 or 20; an effect impossible to any natural power whatever, except electricity. So in Asia Minor, such a cone must have been 300 miles in the diameter of the base, and 200 in the axis; which not all the gun-powder that has been made since the invention of it, much less any vapours generated so far below the surface, could possibly effect.

5. A subterraneous explosion will not account for the manner in which ships, far from land, are affected during an earthquake; which seem as if they struck upon a rock, or as if something thumped against their bottoms. Even the fishes are affected. A subterraneous explosion would only produce a gradual swell, and not give so quick an impulse to the water as would make it feel like a stone.

From comparing these circumstances, the Doctor ^{His method} says, he had always thought that an earthquake was a shock of the same kind as those which commonly occur in electrical experiments. And this hypothesis was confirmed by the phenomena attending earthquakes; particularly those of 1749 and 1750, which gave rise to his publication. <sup>ing for earth-
quakes.</sup>

The weather, for five or six months before, had been uncommonly warm; the wind south and south-west, without rain; so that the earth must have been in a state peculiarly ready for an electrical shock. The flat country of Lincolnshire had been under an exceeding great drought. The uncommonness of the first of these circumstances, he remarks, is the reason why earthquakes are less frequently experienced in the northern than in the southern regions of the world, where the warmth and dryness of the air, so necessary to electricity, are more usual: And the latter shows how fit the dry surface was for an electrical vibration; and (which is of great importance) that earthquakes reach but little below the surface of the earth.

Before the earthquake at London, all vegetables had been uncommonly forward. And electricity is well known to quicken vegetation. The aurora borealis had been frequent about that time; and just before the earthquake, had been twice repeated in such colours as had never been seen before. It had also removed southerly, contrary to what is common in England; so that the Italians, and those among whom earthquakes were frequent, actually foretold the earthquake. The year had been remarkable for fire-balls, lightning, and coruscations; and these are rightly judged to be meteors of an electrical nature.

Earth-
quake.

In these circumstances of the earth and air, nothing, he says, is wanting to produce an earthquake, but the touch of some non-electric body; which must necessarily be had *ab extra* from the region of the air or atmosphere. Hence he infers, that if a non-electric cloud discharge its contents upon any part of the earth, in that highly electrical state, an earthquake must necessarily ensue. As the discharge from an excited tube produces a commotion in the human body, so the discharge of electric matter from the compass of many miles of solid earth must needs be an earthquake; and the snap from the contact, the horrid uncouth noise attending it.

The Doctor had been informed by those who were up and abroad the night preceding the earthquake, and early in the morning, that convulsions in the air were extremely frequent; and that a little before the earthquake, a large and black cloud suddenly covered the atmosphere, which probably occasioned the shock by the discharge of a shower.

A sound was observed to roll from the Thames towards Temple Bar before the houses ceased to nod; just as the electrical snap precedes the shock. This noise (which generally precedes earthquakes) the Doctor thought could be accounted for only on electrical principles: for, in a subterraneous eruption, the direct contrary would happen.

The flames and sulphureous smells, which are sometimes observed in earthquakes, might, he thought, be more easily accounted for, on the supposition of their being electrical phenomena, than from their being occasioned by eruptions from the bowels of the earth. So also the suddenness and expedition of the concussion, it being felt at the same instant over such a large surface, and the little damage also which earthquakes generally occasion; sufficiently point out what sort of a motion it is: not a convulsion of the bowels of the earth; but an uniform vibration along its surface, like that of a musical string, or a glass when rubbed on the edge with one's finger.

The circumstance of earthquakes chiefly affecting the sea-coast, places along rivers (and, adds Doctor Priestley, eminences), is a farther argument of their being electrical phenomena. This is illustrated by a particular account of the direction in which the earthquake was conveyed.

The last argument he uses is taken from the effects which it had on persons of weak constitutions, who were, for a day or two after it happened, troubled with pains in the back, rheumatisms, hysterics, and nervous disorders; just in the same manner as they would have been after an actual electrification: to some these disorders proved fatal.

As to the manner in which the earth and atmosphere are put into this state, which prepares them to receive such a shock, and whence the electric matter comes, the Doctor does not pretend to determine; but thinks it as difficult to be accounted for as magnetism, gravitation, and many other secrets of nature.

⁷⁹ Hypothesis of S. Beccaria; The same hypothesis was advanced by Signior Beccaria, without knowing any thing of Dr Stukeley's discoveries. But this learned Italian imagined the electric matter which occasions earthquakes to be

lodged deep in the bowels of the earth, agreeably to his hypothesis concerning lightning.

Now, as it appears that the quantity of electric matter in the simplest thunder-forms is so inconceivably great, that it is impossible to be contained by any cloud or number of clouds; and as, during the progress of a thunder-form which he observed, though the lightning frequently struck to the earth, the same clouds were the next moment ready to make a still greater discharge; it was evident, that they must have received at one place, the moment a discharge was made from them in another. Let us suppose these clouds ever so great, if the lightning proceeded only from them, the quantity must be lessened by every discharge; and no recruits that any new clouds might bring can bear any proportion to the discharge which must ensue from the collision of so great a number as combine to form a thunder-form. It seems therefore most likely, that the electric matter is continually darting from the clouds in one place, at the same time that it is discharged from the earth in another; and, consequently, that the clouds serve as conductors to convey the electric fluid from those places of the earth which are overloaded with it, to those which are exhausted.

This theory being admitted, there will, he thinks, be little difficulty in attributing earthquakes to the same cause. For if the equilibrium of the electric matter be by any means lost in the bowels of the earth; so that the best method of restoring it shall be by the fluid bursting into the air, and traveling several miles of the atmosphere, to come at the place where it is wanted; it may be easily imagined, that violent concussions will be given to the earth by the sudden passage of so powerful an agent. This, in his opinion, was confirmed by the flashes of light, exactly resembling lightning, which have been frequently seen to rush from the top of Mount Vesuvius, at the time that ashes and other light matters have been carried out of it into the air, and dispersed uniformly over a large tract of country. And it is well known, that volcanoes have a near connection with earthquakes.

A rumbling noise like thunder, and flashes of light rising from the ground, have been generally observed to attend earthquakes. And lightning itself has been known to be attended with small shakings of the earth. So also *ignes fatui*, in mines, he looked upon as an argument that the electric fluid was sometimes collected in the bowels of the earth.

Dr Priestley, in his History of Electricity, observes upon these theories, that a more probable hypothesis may perhaps be formed out of both of them. "Suppose (says he) the electric matter to be, some way or other, accumulated on one part of the surface of the earth, and on account of the dryness of the season not easily to diffuse itself; it may, as Signior Beccaria supposes, force its way into the higher regions of the air, forming clouds in its passage out of the vapours which float in the atmosphere, and occasion a sudden shower, which may further promote the passage of the fluid. The whole surface, thus unloaded, will receive a concussion, like any other conducting substance, on parting with, or receiving a quantity of the electric fluid. The rushing noise will likewise sweep over the whole

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quake.89
Of Dr
Priestley.

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quake.

whole extent of the country. And upon this supposition also, the fluid, in its discharge from the country, will naturally follow the course of the rivers, and also take the advantage of any eminences to facilitate its ascent into the higher regions of the air."

The Doctor, making experiments with a battery on the passage of the electrical fluid over different conducting substances, and, among these, over water;— and remarking a resemblance between its passage over the surface of the water, and that which Dr Stukeley supposed to sweep the surface of the earth, when a considerable quantity of it is discharged to the clouds during an earthquake; immediately suspected that the water over which it passed, and which was visibly thrown into a tremulous motion, must receive a concussion resembling that which is given to the waves of the sea on such an occasion.

To try this, he himself and others present put their hands into the water at the time that the electrical flash passed over its surface; and they felt a sudden concussion given to them, exactly like that which is supposed to affect ships at sea during an earthquake. This percussion was felt in various parts of the water, but was strongest near the place where the explosion was made. The same experiment, with a little variation, being afterwards made with a single jar, at some distance below the surface of the water, produced the like effect, though in a weaker degree. "This similarity in the effect (the Doctor observes) is a considerable evidence of a similarity in the cause.

"Pleased with this resemblance of the earthquake (says he), I endeavoured to imitate that great natural phenomenon in other respects: and it being frosty weather, I took a plate of ice, and placed two sticks about three inches high on their ends, so that they would just stand with ease; and upon another part of the ice I placed a bottle, the cork of which was suspended a brass ball with a fine thread. Then, making the electrical flash pass over the surface of the ice, which it did with a very loud report, the nearer pillar fell down, while the more remote stood; and the ball which had hung nearly still, immediately began to make vibrations about an inch in length, and nearly in a right line from the plate of the flash.

"I afterwards diversified this apparatus, erecting more pillars, and suspending more pendulums, &c. sometimes upon bladders stretched on the mouth of open vessels, and at other times on wet boards swimming in a vessel of water. This last method seemed to answer the best of any: for the board representing the earth, and the water the sea, the phenomena of them both during an earthquake may be imitated at the same time; pillars, &c. being erected on the board, and the electric flash being made to pass either over the board, over the water, or over them both."

81
Deficiency
of all these
hypotheses.

These three hypotheses concerning the cause of earthquakes, though somewhat differing from one another, yet agree in the main; but if a particular solution of the phenomena is required, every one of them will be found deficient.

If, according to Dr Stukeley's hypothesis, the electric matter is lodged only on the surface of the earth, or but at a small depth below, how are we to account for those violent effects which often take place in the bowels of the earth? In the earthquake at Lisbon, a

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quake

large quack sunk to an unfathomable depth. We are certain that the cause of the earthquake must have been below this depth, however great it was, and have opened the earth for an immense way downwards. At the same time an hill in Barbary clave asunder, and the two halves of it fell different ways. This shows, that the cause of the earthquake operated not on the surface of the hill, but on the solid foundation and contents of it;—nor can it be explained by any superficial action whatever. From what the miners at Eyam bridge in Derbyshire observed, it is also evident, that the shock was felt at the depth of 396 feet below the surface of the ground more than at the surface itself; and consequently there is all the reason in the world to think that the cause lay at a depth vastly greater.

Again, though the earthquake at London was supposed to begin with a black cloud and shower; yet in that of 1755, the effects of which were incomparably greater, the air was calm and serene almost in every place where it was felt. It doth not appear that there is at any time a considerable difference between the electricity of the atmosphere and that of the earth, or indeed that there can be so. For if the earth is electrified *plus* and the atmosphere *minus*, there are innumerable points on the surface of the earth which must be imperceptibly drawing off the superfluous electric matter into the air. The vapours also, with which the atmosphere abounds, would always be ready in the same service; and thus thunder and lightning might indeed sometimes be produced, but not earthquakes. But lastly, neither the air nor the earth does always show any remarkable signs of electricity before earthquakes happen. For, the summer before the earthquake at Manchester in 1777, there had scarce been any thunder, lightning, or other signs of electricity in the atmosphere, and vegetation had been extremely backward; and, according to the best accounts, the weather continued remarkably fine.

For these reasons, Dr Stukeley's hypothesis seems not to be satisfactory. That of Signior Beccaria is not indeed liable to the above mentioned objections; but seems highly improbable on another account. The atmosphere is known to be a substance through which the electric matter makes its way with the utmost difficulty. It is a vastly worse conductor than water or than moist earth. If therefore the equilibrium of this fluid is lost in the bowels of the earth, it is impossible to give a reason why it should not rather go to the places where it is wanted through the earth itself, than through the atmosphere. Besides, if this was the case, the shock of an earthquake could only be felt at those places where the electric fluid issued from the earth, and where it entered. All the intermediate places ought to be free from any shock, and to be sensible only of a violent concussion in the atmosphere; but of this we have no example in any history of earthquakes whatever.

Dr Priestley's hypothesis is liable to the same objections with that of Dr Stukeley; for any superficial operation will never account for those effects above mentioned, which take place at great depths below the surface. His experiment cannot be admitted as any way conclusive with regard to the cause of earthquakes, because no quantity of electric fire is seen to pass over

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the earth and sea, like the flash attending the explosion of an electric battery; and the force of his earthquake (being but just able to throw down a stick that could hardly stand by itself) seems by far too little. The utmost force of electricity which man can raise, is indeed very trifling, when compared with the great operations of nature: but it is certain, that the force of an electric battery is by no means contemptible; and was its whole power to be employed in producing an imitation of an earthquake, it certainly would do much more than throw down a small stick. The bad success of this experiment therefore shows, that the Doctor's theory is erroneous: for almost the whole of his electric power was spent another way; and we cannot suppose that any considerable part of the force which produces earthquakes is spent any other way than in the very production of the earthquake itself.

32
Principles on which the phenomena may be explained.

* See Electricity.

If it is attempted to give an explanation of the phenomena of earthquakes, which shall be free from the objections above mentioned, and from all others, it will be necessary, in the first place, to consider those parts of the system of nature which seem to be most affected during the terrible phenomena we treat of. These parts are, the air, the solid earth, and the water. Of these the two former are electric *per se*; the latter is a conductor, though a bad one*. Hence it follows,

1. That in proportion to the quantity of earth which is mixed with any quantity of water, that mixture will approach nearer to the nature of an electric *per se*, and vice versa.

2. It also follows, that whatever quantity of electricity is communicated to the solid earth, will be quickly taken off from it by the water which is mixed with it, in the same manner that the electric matter is carried off from an excited globe by a metallic conductor.

3. The whole earth is moist, and therefore in some degree a conductor. Nevertheless, as earth of all kinds, when perfectly dry, is found to be an electric capable of receiving a charge like glass, it is therefore possible, that the electric power of the earth may be excited to such a degree, that the moisture of the solid parts cannot easily contain the quantity of electricity communicated.

4. In this case, the earth must either give undoubted signs of its being excited in the same manner that other excited electrics do, or the electricity must be discharged somewhere else.

5. To receive any superfluous quantity of electric matter that may be communicated to the solid earth, the waters of the ocean are always ready. These, being a much better conductor than earth, must be a principal mean of preserving the equilibrium of electricity in the different parts of the earth; and hence we see a natural reason why the waters of the ocean should cover so large a proportion of the globe as they are known to do. See OCEAN.

6. It is known, that fire is also a conductor of electricity. Therefore, wherever a quantity of electric matter is collected in any part of the solid earth, if it can neither be conveniently received by the moisture which the earth naturally contains, nor by the ocean in its neighbourhood, it will discharge itself by any volcano that happens to be in an active state, near the place where that collection of electric matter is.

7. It is also found, that the electric fluid, being violently resisted by the superincumbent atmosphere, hath always a tendency to discharge itself in those places where that resistance is least. The tops of high mountains, therefore, where the weight of the atmosphere is greatly diminished, will also afford a ready passage for the electric fluid when it is collected in very great quantity in the bowels of the earth.

8. If, from some natural causes, the electric matter shall happen to be collected in the bowels of the earth in any particular place, and at the same time such obstacles are thrown in its way, that it can neither discharge itself into the ocean, nor into the atmosphere by the tops of high mountains, nor by the more open passages of volcanoes; the most terrible consequences must ensue: the matter being pent up, and the cause by which it is collected continuing still to act, its impulse becomes at last irresistible. It then flies against every obstacle with inconceivable violence. It breaks out in all those places where there is the least resistance, and therefore the shock is directed a great number of different ways at once. Houses, steeples, trees, &c. by their height take off somewhat of the pressure of the atmosphere; and therefore the electric matter flies against them very violently. The houses and other buildings being bad conductors, are thrown down; the trees affording a readier passage to the fluid are not hurt, though even they also are sometimes split. The height of the mountains renders them the objects of the destructive force of this fluid much more than any buildings whatever. Hence they are often rent, and rocks thrown down from them. The water contained in the solid parts of the earth, being a conductor of electricity, becomes overloaded with it; and when it can receive no more, is forced to yield to the impulse of the rest, and therefore is thrown out of the earth in great quantities. For the same reason, the waters on the surface of the earth are most violently agitated. The small quantities contained in wells are thrown out at the tops of them: The rivers and lakes, which contain too great a quantity of water to be thrown off from the earth, rise in billows: The ocean itself, receiving more electric matter than can be immediately dispersed through the whole body of water, or evaporate into the atmosphere, retreats from the land, and is raised in vast mountains. The solid earth, being unable either to conduct the fluid quietly to those parts where it is wanted, or to retain it, is violently shaken or rent in multitudes of places; and this not only on the surface, but to great depths. The electricity being now in some measure discharged from the earth, the ocean rushes forward with fury to discharge in its turn the excess of electric matter it just before received from the earth. If there are volcanoes in the neighbourhood, the violent discharge of electricity is sure to manifest itself by setting them in a flame; and thus, till the equilibrium is restored, all nature seems to be threatened with dissolution.—Even in those places where the force of the electric fluid is not able to shake the solid parts of the earth, it manifests its power by agitating the waters in the manner above described. Water being a much better conductor of electricity than earth, this subtle fluid, as soon as it can get out from the solid earth, flies to the water. The consequence is, that the water immediately swells up, and

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is attracted by whatever part of the earth has less electricity than itself. Hence those strange irregular motions of the waters in different places, & particularly observed at the time of the earthquake at Lisbon; and which it seems impossible to account for from any other cause than an immediate discharge of electric matter from the earth into them.

9. As it is impossible that any part of the earth can be electrified without communicating a proportionable share of electricity to the animals that live upon it, and have a constant communication with it, it thence follows, that there can be no considerable commotion in the electric matter lodged in the bowels of the earth, without affecting that which is contained in the bodies of the animals. Hence the brutes, who seem to be more sensible of such commotions than we, run about, and show signs of fear, before the earthquake comes on; and hence the giddiness, sickness, &c. which the human race are subject to during the time of the shock, even though they do not feel it, as was the case at Gibraltar.

10. As the atmosphere hath a communication with the earth, it is scarce to be supposed that the earth can, for any length of time, contain a considerable quantity of electric matter, without communicating to the atmosphere a proportionable quantity. Before an earthquake, therefore, we must suppose the electricity of the earth and air to be in perfect equilibrio. Hence the weather is serene, there is no wind, nor any other sign in the atmosphere, of the terrible catastrophe that is about to ensue. But the moment the discharge is made from the earth, the equilibrium between the terrestrial and atmospheric electricity is broken; the air either begins to receive the fluid from the earth, or the earth from the air. As there is not then time for the collection of thunder-clouds by which the electricity may be brought down in sudden flashes of lightning, the fluid breaks through the substance of the air itself with dismal and horrid noises, which always accompany an earthquake. That this is the case, seems highly probable from an experiment of M. de Romas, when, having brought down a vast quantity of electric matter from the clouds by means of a kite, he heard the noise it made in the air, like the continual blowing of a small forge bellows. In general, a considerable change of weather takes place at the time of an earthquake, though not always. In the earthquake which happened in England in 1777, there was no remarkable change of weather there; but, soon after, there was a great deal of thunder and lightning in the southern parts of Scotland: which seems to indicate, that the electric fluid discharged from the earth in England had taken its course northward, and produced the phenomena before mentioned in Scotland. The same observation may likewise be made with regard to 1789, when there were slight shocks of an earthquake both in England and Scotland. That in England being the first, was followed by an uncommon frequency of thunder and lightning in the southern parts of Scotland; by reason of the progress of the electric matter northward after it was discharged into the atmosphere: but the shocks which happened in the northern part of Scotland (*viz.* about Crief in Stirlingshire) were not followed by any thunder to the southward; because the electric matter, though dis-

charged into the atmosphere, cannot return to the south without first going north, and rising up into the higher regions.

In the earthquakes in Calabria, in the year 1783, there were some circumstances which seem to militate against the theory just now laid down. The most remarkable of these is their attacking the places situated on the plain much more than those which stood on the higher grounds. This is particularly insisted upon by Sir William Hamilton. "If two towns (says he) were situated at an equal distance from the centre (of the force of the earthquake), the one on a hill, the other on the plain or in a bottom, the latter always suffered greatly more from the shocks of the earthquake than the former; a sufficient proof to me of the cause coming from beneath, as this must naturally have been productive of such an effect. And I have reason to believe, that the bottom of the sea, being still nearer the volcanic cause, would be found, if it could be seen, to have suffered still more than the plain itself; but the philosophers, who do not easily abandon their ancient systems, make the present earthquakes to proceed from the high mountains of the Apennines that divide Calabria Ultra, such as the Monte Dejo, Monte Caulone, and Asframonte. I would ask them this simple question, Did the Eolian or Lipari islands (all which rose undoubtedly from the bottom of the sea by volcanic explosions, at different and perhaps very distant periods) owe their birth to the Apennines in Calabria, or to veins of minerals in the bowels of the earth and under the bottom of the sea? Stromboli, an active volcano, and probably the youngest of those islands, is not above 50 miles from those parts of Calabria that have suffered most by the late earthquakes. The vertical shocks, or, in other words, those whose impulse was from the bottom upwards, have been the most destructive to the unhappy towns in the plain. Did they proceed from Monte Dejo, Monte Caulone, or Asframonte? In short, the idea I have of the present local earthquakes is, that they have been caused by the same kind of matter that gave birth to the Eolian islands; that perhaps an opening may have been made at the bottom of the sea, and most probably between Stromboli and Calabria Ultra; for from that quarter all agree that the subterraneous noises seem to have proceeded; and that the foundation of a new island or volcano may have been laid, though it may be ages, which to nature are but moments, before it is completed and appears above the surface of the sea. Perhaps, too, the whole destruction I have been describing may have proceeded simply from the exhalations of confined vapours generated by the fermentation of such minerals as produce volcanoes, which have escaped where they meet with the least resistance, and must naturally, in a greater degree, have affected the plain than the high and solid grounds around it."

In a memoir on this earthquake by M. Dolomieu, Electricity that author endeavours to exclude electricity from having had any share in the matter. "The sea (says he), during the earthquakes of 1783, had little share in the shocks of the main land. The mass of water experienced no general movement of fluctuation or oscillation; the waves did not rise above their ordinary limits. Those which, on the night of the 5th of February, beat against the coast of Scilla, and which af-

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83
Circumstances in the earthquakes of 1783 seem to militate to this theory.

84
This earthquake less violent among the Apennine mountains than elsewhere.

85
Sir William Hamilton's opinion of the cause.

86
Electricity denied by M. Dolomieu to have any share in the production of earthquakes.

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terwards covered the point of the Faro of Messina, were only the effects of a particular cause. The fall of a mountain into the sea raised the waters, which received an undulating motion, as happens always in similar cases. The undulation reached from the point of Sicily beyond the Cape of Rofaccolmo, extending in length along the coast which runs to the south; but always with a decrease in elevation as it was more remote from Sicily. Whatever inquiries the author has made, he has not been able to discover, in all the details which have been given him, any proofs of the existence of electrical phenomena: no spark, no disengagement of the electrical fluid, which the Neapolitan naturalists wish to assign as the cause of earthquakes.

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Of the state
of the at-
mosphere.

"The state of the atmosphere was not the same in the whole range of earthquakes. While the tempests and the rain seemed to have conspired with them for the destruction of Messina, the interior part of Calabria enjoyed very fine weather. A little rain fell in the plain in the morning of the 5th of February; but the sky was clear during the rest of the day. This month and that of March were not only pretty serene, but likewise warm. There were some storms and rain; but they were the natural attendants of the season.

"The moving force seems to have resided under Calabria itself, since the sea which surrounds it had no share in the oscillations or vibrations of the continent. This force seems also to have advanced along the ridge of the Appennines in ascending from the south to the north. But what power in nature is capable of producing such effects? I exclude electricity, which cannot accumulate continually during the course of a year, in a country surrounded with water, where every thing conspires to place this fluid in equilibrio. Fire remains to be considered. This element, by acting directly upon the solids, can only dilate them; then their expansion is progressive, and cannot produce violent and instantaneous movements. When fire acts upon fluids, such as air and water, it gives them an astonishing expansion; and we know that then their elastic force is capable of overcoming the greatest resistances. These appear the only means which nature could employ to operate the effects we speak of; but in all Calabria there is no vestige of a volcano; nothing to point out any interior combustion; no fire concealed in the centre of mountains, or under their base; a fire which could not exist without some external signs. The vapours dilated, the air rarefied by a heat constantly active, must have escaped through some of the crevices or clefts formed in the soil; they must then have formed currents. Both flame and smoke must have issued by some one or other of these passages. These once opened, the pressure would have ceased; the force not meeting with any more resistance, would have lost its effect; and the earthquakes could have no longer continued. None of these phenomena took place: we must then renounce the supposition of a combustion acting directly under Calabria. Let us see if having recourse to a fire at some distance from this province, and acting upon it only as an occasional cause, we shall be able to explain all the phenomena which have accompanied the shocks. Let us take for example *Ætna* in Sicily, and suppose large cavities under the mountains of Calabria; a supposition which cannot be refused. It is cer-

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tain that immense subterraneous cavities do exist, since *Ætna*, in elevating itself by the accumulation of its explosions, must leave in the heart of the earth cavities proportioned to the greatness of the mass.

"The autumn of 1782 and the winter of 1783 were very rainy. The interior waters, augmented by those of the surface, may have run into those caverns which form the focus of *Ætna*: there they must have been converted into vapour capable of the highest degree of expansion, and must have pressed forcibly against every thing which opposed their dilatation. If they found means to conduct them into the cavities of Calabria, they could not fail to occasion there all the calamities of which I have given the description.

"If the first cavity is separated from the second by a wall (so to speak) or some slight division, and this separation is broken down by the force of the elastic vapour, the whole force will act against the bottom and sides of the second. The focus of the shocks will appear to have changed place, and become weaker in the space which was agitated most violently by the first earthquake.

"The plain, which was undoubtedly the most slender part of the vault, yielded most easily. The city of Messina, placed upon low ground, experienced a shock which the buildings on higher grounds did not. The moving force ceased at once as suddenly as it acted violently. When, at the periods of the 7th of February and the 28th of March, the focus appeared changed, the plain scarce suffered any thing. The subterraneous noise, which preceded and accompanied the shocks, appeared always to come from the south-west, in the direction of Messina. It seemed like thunder under ground, which resounded beneath vaults.

"If *Ætna*, then, has been the occasional cause of the earthquakes, it has also prepared, for some time, the misfortunes of Calabria, by gradually opening a passage along the coast of Sicily to the foot of the Neptunian mountains: for during the earthquakes of 1780, which disturbed Messina the whole summer, they felt, the whole length of that coast, from Taormina even to the Faro, considerable shocks; but near the village of Alli and Fiume de Nisi, which are situated about the middle of that line, shocks so violent were experienced, that they dreathed left the mouth of a volcano should open. Each shock resembled the effort of a mine that had not strength to make an explosion. It appears, that then the volcano opened a free passage for the expansion of its vapours, and that they have since circulated without restraint; since in the year 1783 the earthquake was almost nothing upon that part of Sicily, at the time that Messina buried under its ruins the half of its inhabitants."

On this theory it is first to be observed, that there is a considerable disagreement in points of fact between M. Dolomieu and Sir William Hamilton. The former could find no account of any spark or other electrical phenomenon: the latter, on the contrary, was assured that flames had often been seen to issue from the earth; and these he expressly attributes to a vapour charged with electrical fire. M. Dolomieu takes little notice of the rains that fell; while Sir William Hamilton attributes to them several of those disruptions of the earth, which, without them, would have seemed very extraordinary. The latter likewise informs

89
Where a
supply of
water suf-
ficient to
produce
such effects
might be
derived.

90
Disagree-
ment with
regard to
facts be-
tween M.
Dolomieu
and Sir
William
Hamilton.

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91
Proofs of electricity being concerned.

92
M. Dolomieu's hypothesis is sufficient.

93
Of the foreknowledge which brute animals had of the shock.

94
Erroneous method of arguing pursued by M. Dolomieu.

95
The earthquakes could not be occasioned by water poured into Mount *Ætna*.

us, that before a shock the clouds remained motionless; and that, after a heavy shower of rain, a smart shock followed. These were phenomena that showed some connection between what passed in the earth and in the atmosphere: but betwixt these two there is no agent that we know of excepting electricity, at least there is none of sufficient strength to produce any violent effects by communication between the one and the other. The most enthusiastic imagination cannot suppose that huge cauldrons of boiling water under Mount *Ætna* should make the clouds stand still over Calabria; and the quick succession of the shock to an heavy shower of rain showed that the cause, whatever it was, lay in the ground on which the rain fell, and that it could be put in action by what affected the surface of the ground. But the cause of earthquakes appears, from the facts related n° 25, to lie at a greater depth in the earth than 396 feet; but no shower of rain could affect the earth to this depth unless by making some alteration in its electricity. These phenomena, which M. Dolomieu has overlooked, evidently show that electricity was concerned in this earthquake as well as others.

Another circumstance, which M. Dolomieu himself mentions, is a sufficient proof of electricity being concerned; and that is the prementism which animals had of its approach. "The prementism of animals (says he) at the approach of earthquakes, is a singular phenomenon, and which cannot fail to surprize us so much the more, as we know not by what organs it is communicated to them. Every species of animals experiences it, especially dogs, geese, and poultry. The howlings of the dogs in the streets of Messina were so loud, that orders were issued to kill them." Now, we know that many animals have a prementism of a change of weather; which may happen either from a change of the density of the atmosphere, or from some alteration in its electricity: but steam pent up in the bowels of the earth could affect no animal until it began to exert its effects. Sir William Hamilton likewise informs us, that geese seemed more affected by this cause when in the water than out of it; which may easily be explained upon electrical principles, but not at all, at least not without the most extravagant suppositions, by steam pent up in caverns nobody knows where.

Again, it is evident that Mr Dolomieu's hypothesis is supported in the worst manner imaginable, viz. by arguing from things unknown to what we see; but the true method of argument always is from what we see to things unknown. By this unhappy error he has made choice of causes which cannot possibly answer the purpose. Let any quantity of water we please be poured into the focus of mount *Ætna*; nay, let the sea itself break into it: the consequence could only have been what happened in 1755, viz. not an earthquake in Calabria, but a vast effusion of boiling water from the top of the mountain itself. Nature here made the experiment; and we have no reason to imagine that any other consequence would have followed, though it had been repeated ever so often. Our author seems also to have forgot, that aqueous steam is capable of condensation, and that when it is admitted into a cold place it instantly loses its expansive power. Let us suppose caverns upon caverns extended in any

way he pleases: the greater their bulk, the more will he be embarrassed; for thus the steam would have room to circulate; and far from producing those dreadful convulsions, must have returned quietly into water, without being able to stir the earth in the least. It would appear indeed, that the power of aqueous steam being very much over-rated both by M. Dolomieu and other writers. An anonymous author in the *Journal de Physique* for August 1785, has drawn a comparison between volcanoes and steam-engines; and expresses his surprize that nobody has taken notice of it sooner. "A steam-engine (says he), consists of a caldron or boiler, covered with a lid, having an opening in the middle, to which is fitted an hollow cylinder, &c. The boiler is set over a fire, and from the water in it rises a vapour, the expansive force of which raises the piston of the machine. The action of the vapour is afterwards instantaneously annihilated by a jet of cold water into the cylinder through a hole, when the weight of the atmosphere takes place, forces down the piston, and consequently raises the water in the pump.

"It is known that vapour occupies a space 15,000 or 16,000 times greater than the bulk of the water which produced it; hence it follows, that the smaller the space is in which it is contained, the force of its expansion will be the greater. It has sometimes happened, that vapour, in a steam-engine, not having sufficient play, has burst the vessels in which it was contained, destroyed the building, and thrown the stones and boiling water to a great distance. It is now furnished with holes, by which the quantity of water can be ascertained, and with a valve which gives way when the vapour is superabundant. When the vapour issues by this valve, it strikes the air with such force as to occasion a very loud hissing noise. The force of vapour sufficient for raising a piston of a given diameter is equal to the weight of a column of water 22 feet in height, and of a base equal to the piston; so that, suppose a cubic foot of water to weigh 70 pounds, and the piston to be a foot square, the force of the vapour sufficient for raising it will be 1540 pounds; an agent so powerful, that hardly any thing else in nature can be compared with it.

"Now if we recollect the descriptions of volcanoes, their eruptions, the earthquakes and hissing noises, which sometimes precede or accompany them; the stones of different sorts, boiling water, sulphur, and bitumens which they discharge; if we hear of rocks thrown to the distance of seven or eight miles from the mouth of the volcano; clouds of ashes, and torrents of lava, seas overflowing, rivers left dry, &c. &c. we will find all these the effects of great natural steam-engines: that is to say, they are produced by masses of combustible matter set on fire by fermentation, placed in the neighbourhood of caverns filled with the waters of the sea, of rivers or lakes. We cannot doubt that the interior parts of the earth are hollowed out into numberless caverns that extend in different directions, and to various depths; and that mountains and other inequalities, and the buildings raised by men, are merely the lid or covering, more or less thick, of these caverns, which vary in shape, and in the materials of which they are composed. Places therefore covered with buildings and mountains, are more liable

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Comparison between volcanoes and steam-engines.

97
Volcanoes, earthquakes, &c. which sometimes precede or accompany them; the stones of different sorts, boiling water, sulphur, and bitumens which they discharge; if we hear of rocks thrown to the distance of seven or eight miles from the mouth of the volcano; clouds of ashes, and torrents of lava, seas overflowing, rivers left dry, &c. &c. we will find all these the effects of great natural steam-engines: that is to say, they are produced by masses of combustible matter set on fire by fermentation, placed in the neighbourhood of caverns filled with the waters of the sea, of rivers or lakes. We cannot doubt that the interior parts of the earth are hollowed out into numberless caverns that extend in different directions, and to various depths; and that mountains and other inequalities, and the buildings raised by men, are merely the lid or covering, more or less thick, of these caverns, which vary in shape, and in the materials of which they are composed. Places therefore covered with buildings and mountains, are more liable

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ble to earthquakes, because they are less able to give way to the shock: and the farther places are distant from volcanoes, the less they have to fear from earthquakes; because the vapour having room to expand itself by the ramifications of the subterraneous passages, the shocks will be less violent and less frequent. It is this which, in all probability, has hitherto saved Naples.

"Now, let it not be said, that we have mistaken the cause of earthquakes: for if, on the one hand, we attentively consider the steam-engine and its effects, and on the other, observe volcanoes always in the neighbourhood of water, we will be convinced, that they differ in nothing from that machine, but because this is under the command and direction of art. The disappearance and formation of islands and mountains may be explained from the sinking in of caverns, or from their being lifted up by the force of vapour.—Lastly, those vapours which, in the year 1783, covered at the same time, and almost during four months, a part of Europe, Asia, and Africa, were probably vapour escaped from those great internal caverns, heated by a sufficient quantity of combustible matters, set on fire by fermentation in the great chemical laboratories in the bowels of the earth. In certain districts of Burgundy, these vapours were found to be hot, for they dried up and destroyed the grapes.⁷³

⁶⁸ This hypothesis is no doubt; but all that we see them usually perform, is little more than merely overcoming the pressure of the atmosphere on the piston of the cylinder. Now this pressure is equally strong over the whole surface of the earth; so that before the ground could be shaken in the smallest degree, the whole pressure of the atmosphere incumbent upon it must be removed. But if we begin to make any calculations with regard even to this force, which must be removed as a preliminary, we shall find it to be inconceivably great. A square mile contains 27,878,400 square feet; and upon each of these the pressure is 2160 pounds. The atmospheric pressure on a square mile is the product of these two numbers, or 60,217,344,000 pounds; but the great earthquake of 1755 shook no less than 4,000,000 of square miles of the earth; and therefore must in the first place have overcome a pressure of more than 240,000 millions of millions of pounds: and after all this, it had still a much greater obstacle, viz. the immense weight and cohesion of the earth itself. Dr Stukely* has calculated, that no conceivable quantity of gunpowder could have moved the earth shaken by the earthquake in Asia Minor, which affected a circle of 300 miles diameter: but the earthquake of 1755 must have required not only a much greater power to move the earth, as affecting a surface much greater than that of a circle 300 miles in diameter, but also the atmospheric pressure above mentioned, which does not enter into the Doctor's calculation. There cannot therefore be any conceivable quantity of water, of fire, or of steam in the bowels of the earth, sufficient to produce such effects; nor is there any power in nature to which we can with the smallest probability attribute them, electricity alone excepted. Calculations have indeed been made, that the force of steam is 28 times greater than that of gunpowder: but this seems only to be in one particular case, viz. when water is thrown upon melted

⁶⁹ Excessive pressure of the atmosphere to be overcome before an earthquake can take place.

* See n° 77.

¹⁰⁰ Power of steam generally overrated.

copper; which cannot possibly take place in the bowels of the earth. In other cases water explodes with much less violence; and, when thrown upon melted glass, does not explode at all. The very violent effects of water when thrown upon copper in fusion, therefore, most probably are to be attributed to a decomposition of the water, one part of it being united to the calx of the metal, and the other suddenly converted into an aerial vapour; the instantaneous production and rarefaction of which seems in most cases to be the cause of explosion*. The simple pressure of steam, and the bursting of a vessel by it when long continued, cannot at all be introduced as a parallel case, nor are the effects in any degree similar; because we cannot imagine solid metallic vessels in the bowels of the earth to confine the steam till it acquired such strength. At all events the steam must have penetrated the loose earth, which it could not fail to meet with in many places, loosened it, and condensed itself; and if any person will cover a steam engine with stones and rubbish instead of a close lid, he will certainly find this to be the case.

The only power with which we are acquainted, and of the uses which is capable of producing earthquakes, then, being that of the electrical fluid, it only remains to consider what uses they may be thought to answer in the system of nature. As they are the effects of the very highest natural power, it cannot be supposed that they are produced merely for the purposes of destruction; and, on the other hand, as they certainly do a great deal of mischief, it seems as difficult to assign any benevolent purpose they can answer. It is very generally supposed, indeed, that earthquakes are the means by which Nature raises mountains and land from the bottom of the sea; but this can never be admitted. We have many instances of mountains being swallowed up and lost by earthquakes, but not a single well attested one of a mountain being raised by them; and even when volcanoes are taken into the account, by which some mountains and islands have certainly been raised, the balance appears against them, and more land seems to have been sunk by them than ever was raised*. It seems most probable therefore that earthquakes are accidental, and that the mischief they do is only to prevent a greater evil. This we see takes place throughout the whole system of nature. Thunder and lightning, violent rains, storms of wind, &c. are all productive of much damage on certain occasions; but we by no means suppose these phenomena to take place merely for destruction; and therefore we name such effects accidents. To the same account, though on a larger scale, must we place earthquakes; and it only now remains to consider what are the disasters still more terrible than earthquakes which we should have occasion to dread, did they not interpose to prevent them.

These evils are naturally to be dreaded from any general commotion of the electric fluid dispersed throughout the whole globe of earth. That it does pervade it to the centre, is what we can have no reason to doubt; but in the internal parts it seems to lie dormant, or to be employed in operations which never manifest themselves to us. Towards the surface it is manifestly set in motion by the light of the sun, which, as proved under the article ELECTRICITY, and in various other parts of this work, is the very same fluid. This produces

Earth-quake.

¹⁰¹ Explosion of water with copper probably by a decomposition.

* See Essay.

¹⁰² Of the uses of earthquakes.

¹⁰³ They cannot be the means of raising mountains.

* See Vol. 100.

¹⁰⁴ Are probably accidental circumstances, by which greater evils are prevented.

Earth-quake.

105
A constant current of electric matter from the equator to the poles.

106
Dreadful consequences of an universal commotion in the electric fluid.

107
Why this can never take place.

108
Progress of the electric matter discernible after the earthquake in Calabria.

109
Occasional violent eruptions of fire in Greenland and Iceland.

110
Violent thunder-storms throughout all Europe.

111
Appears in the great meteor of 1783.

duces a constant current through the bowels of the earth from the equator towards the poles; for as the equatorial parts absorb more of the light than those farther south or north, it must naturally be driven out in the northern and southern regions in proportion to the quantity absorbed at the equator. In what manner earthquakes are then produced by it, has already been explained at length. They are the shocks occasioned by its passing in great quantity from one place where it is pressed and confined, to another from which it has a free passage; or from a part of the earth positively electrified, to one that is negatively so. Let us suppose, however, that such obstructions are thrown in its way, that it cannot get out of the earth by any passage. The consequence of this must very soon be, that the motion of the light acting upon the equatorial parts would be propagated through the whole globe; and this would be productive of consequences much more terrible than any we can conceive. We see that by setting it in motion in a small part of the atmosphere or of the earth, the most violent effects ensue; but should this tremendous fluid be obliged to put forth all its strength, the earth must be shaken from the centre. Instead of plantations and little hills removed from their places, as in Calabria, it is more than probable that the largest islands and continents would be detached from their bases, or perhaps an universal dissolution ensue. Happily, however, such an effect never can take place, because the electric matter always vents itself by the superficial parts; for the depths to which even the caules of earthquakes and volcanoes descend, are undoubtedly superficial in comparison of the vast thickness of the body of the earth itself. The great bulk of electric fluid therefore lies quietly in the central parts; and is never moved by the commotions of that which lies on the surface, any more than the water at the bottom of the ocean is moved by the storms which ruffle the upper part.

In the earthquakes in Calabria, the progress of the electric matter northward might be traced both thro' the bowels of the earth and through the atmosphere. The great shocks happened in the month of February, but continued more or less through the whole summer. It was observed that Stromboli smoked less than usual, and no particular eruption happened either of *Ætna* or *Vesuvius*. This showed that the electric matter was going somewhere else; nor was it long of discovering the course it had taken. In the beginning of summer a violent volcanic eruption took place in Greenland; its extent and power, however, were not known; but in the beginning of June a volcanic earthquake commenced in Iceland, and continued for eleven days without intermission. This was followed by the most extraordinary effusion of lava recorded in history, which continued till the 12th of August. All this time there were violent and numerous thunder storms, first in the southern and then in the more northerly parts of Europe; the air was covered with a never-ceasing haze, not of a moist nature, as our author in the *Journal de Physique* supposes, and which he absurdly says dried the grapes in Burgundy, but plainly of some other kind, and which prevented the light of the sun from having its usual effect. Six days after the immense volcanic eruption in Iceland had ceased, the great meteor made its appearance, which no doubt

was the very same quantity of electric matter that had raised such horrid commotions in the earth and atmosphere, returning thro' the higher spaces to the south from whence it had originally proceeded.

Before we dismiss this article, it may still be necessary to obviate an objection which may be raised from what is said under the article *LIGHTNING*. It is there shown, that in the time of a thunder storm, the parts of the earth which lie directly under the clouds are divided for some space downward into alternate zones positively and negatively electrified; that the lightning from the cloud strikes not the uppermost stratum directly, but only as it is impossible to avoid it, because it lies betwixt the cloud and the zone by which the electric matter is attracted. It may then be asked, Why an earthquake is not produced by the discharge of these two opposite electricities into one another directly, without the production of any thunder? Here, however, we must observe, that the electricity is originally accumulated in the atmosphere, where the vapours serve as conductors, and the surrounding air and upper surface of the earth being electrified the same way, prevent the electric matter from silently discharging itself, by insulating the clouds in the same manner that the conductor of a machine is insulated by the electric substance on which it stands. The flash of lightning must therefore burst out from these conductors in the very same manner that a spark proceeds from the prime conductor of an electrical machine, rather than from the globe or atmosphere next to it, though both of them are undoubtedly very highly electrified at the time the machine is set in motion. At the same time it must be considered, that this continual flashing of the atmospherical electricity towards the earth, prevents any very high degree of it from accumulating in either of the terrestrial zones already mentioned, so as to produce any discharge between them, which would indeed produce a shock of an earthquake.

From an unhappy accident which happened in 1785, of electricity related by Mr Brydone in the *Phil. Trans.* for that year, we learn, that though in a thunder storm the atmospherical electricity and that of the earth are the same, from the yet at some distance there is a difference betwixt them, earth, and discharges are made from the one to the other. The accident alluded to was the destruction of a man *A fatal accident* and two horses by an electrical explosion from the clouds by earth in the time of a thunder storm. At the place where the explosion happened, there was an interval of 25 or 30 seconds betwixt the flash and the clap of thunder, so that it must have been at the distance of between five and six miles; the great explosion suddenly burst out from the spot over which the cart-wheels passed to which the horses were yoked, partially melted the iron of the wheels, killed the man who sat on the fore-part of the cart, and tore his clothes almost to pieces. Two circular holes of about 20 inches diameter were made in the ground, and the earth and stones scattered about; but no fire was perceived. About an hour before the explosion, some fishermen were caught in a violent whirlwind, which felt hot and sultry. A lamb was killed by another explosion about a quarter of an hour before the great one, and a woman received a violent stroke on the foot without being able to tell whence it proceeded. At the time the lamb was killed, the shepherd

Earth-quake.

112
Why earthquakes do not happen in the time of thunder storms.

113
Of electrical explosions proceeding from the earth, and discharges are made from the one to the other.

114
A fatal accident by an electrical explosion from the clouds by earth in the time of a thunder storm.

Earth-quake.

Shepherd said he felt a sensation as if fire had passed over his face.

115
Earth-
quakes can-
not happen
where there
is a differ-
ence be-
tween the
electricity
of the at-
mosphere
and that of
the earth.

* See *Light-
ning and
Meteors.*

116
Conical
hollows in
the earth
observed by
Sir William
Hamilton
accounted
for.

117
Ultimate
cause of all
the phenom-
ena.

Earth-quake.

By these explosions, particularly the great one, the equilibrium of electricity in the atmosphere was instantly restored, and the clouds forthwith began to separate. The reason of this is explained under the article *LIGHTNING*; here it is sufficient to observe, that where there is a difference between the electricity of the atmosphere and that of the earth, an earthquake cannot happen. Those electrical explosions experimentally demonstrate the truth of what is argued from the principles of electricity, n° 82, viz. that just before an earthquake there is a perfect equilibrium between the electricity of the atmosphere and that of the surface of the earth. When this equilibrium is broken, the earth discharges its superfluous quantity either silently, by means of trees, grass, &c. or sometimes by explosions in different places; but as there is no general conductor, there cannot be any general discharge of the whole at once. The singular case of the great discharge in 1785 was owing only to the accidental presence of a good conductor, viz. the iron of the cart-wheels passing over the spot where the electric matter happened to be collected in great quantity. Had not this taken place, it is possible that a fire-ball might have risen from the earth; for the explosion produced effects extremely similar to those of the bursting of fire-balls*: but still this could have no effect in producing any shock of an earthquake; because the latter would have required a general discharge betwixt two great strata of earth, where there cannot be any conductor to make partial ones.

In the time of earthquakes, however, there are undoubtedly many such electrical discharges from the earth as those just mentioned; and they are most probably the cause of those conical hollows observed by Sir William Hamilton. When water is abundant in any part of the earth, it serves as a conductor for some quantity of the electricity, and that fluid is violently thrown out into the air: but where there is a deficiency of water, the fire breaks forth in its proper form with loud explosions, as was observed; as well as the water spouts in Calabria in the year 1783. That year also the quantity of electric matter discharged by the earth into the air was manifest by the vast number of thunder storms which immediately followed them. No fire was observed at the time of the explosion which put an end to the thunder-storm above mentioned; but this must have arisen partly from its happening in the day-time, and partly from the electric matter having for many conductors to spend its force upon.

Having thus explained all the phenomena attending earthquakes, it remains only to show by what means the equilibrium of electricity can be broken in the bowels of the earth in such a manner as to produce these phenomena. The ultimate cause of this is mentioned under the article *AVRORA BOREALIS*, n° 5. It is there shown, that the warmth of the sun must necessarily bring down to the earth much greater quantities of electric matter in the regions within the tropics than in the northern and southern climates. It is impossible, as is there also observed, that there can be a perpetual accumulation of electricity in one part of the earth, unless there is a passage for it into the atmosphere

through some other. Hence, if the electric matter descends from the air into one place of the earth, it must necessarily ascend from the earth into the air in some other place. There must be therefore a continual current of electricity through the bowels of the earth, beginning at the equator, and extending northward and southward to both poles. While this current has a free passage from the earth in the northern and southern regions, every thing goes on quietly; and whatever storms may happen in the atmosphere, the solid earth cannot be affected. Innumerable circumstances, however, may tend to hinder this discharge, and consequently to accumulate the electric matter in particular places. One very obvious cause of this kind, is an excessive frost taking place in any part of the earth whence the electric matter was wont to be discharged. This renders the air itself so electric, that it cannot receive the fluid; at the same time that the water on the surface of the earth, being hard frozen, becomes electric also, and incapable of conducting. Very dry seasons likewise contribute to produce the same effect; and thus the accumulation of electricity in the warmer climates becomes prodigiously great. Hence perhaps we have some reason to conclude, that the excessive cold which prevailed over all Europe in 1782 was a principal cause of the earthquakes in 1783.

It must, however, be observed, that with regard to the operations of nature we cannot always reason analogically from our electric experiments. If a quantity of electricity is collected in any substance by artificial means, that quantity is taken off in a moment by the touch of any metallic substance or other good conductor. As the whole earth, therefore, is filled with a conducting substance, namely water, it may very naturally be asked, Why does not the superfluous quantity of electric matter collected in one place, immediately disperse itself through all other parts of the earth by means of the water with which it abounds?—To obviate this difficulty, however, it needs only be remembered, that as the earth is quite full of electric matter all round, no quantity can enter any particular part without being resisted by the rest which is diffused through the whole globe. This resistance will be proportioned to the facility with which it can escape at other places; and this it never can do, unless the earth is in a proper condition for emitting, and the atmosphere for receiving, it. The pressure, therefore, upon the accumulated quantity of electric matter soon becomes exceedingly great, and its disposition to burst out with violence is every day increased. At last, as the sun still continues to occasion the descent of more and more of the electric fluid, that particular part of the earth becomes fully charged. The consequence of this is, that the waters of fountains become foul; the electric matter being lodged in great quantity in the water, forces it into unusual agitations, by which the earth is mixed with it. The ocean, for the same reason, is raised in huge billows, &c.; and these appearances prognosticate the shock, in the same manner that slight flashes from the knob of an electrified bottle prognosticate a discharge of all the electricity contained in it.

Besides the earthquakes above described, of which the cause seems to depend entirely on a collection of electric matter in the bowels of the earth, there are others frequently felt in the neighbourhood of volcanoes, which

Easel

Easter-
Island.

Which are plainly owing to the efforts of the burning matter to discharge itself. These, however, are but slight, and seldom extend to any considerable distance from the burning mountain. For a particular account of them, see the article *VOLCANO*.

EASEL *PISSES*, among painters, such smaller pieces, either portraits or landscapes, as are painted on the easel, *i. e.* the frame whereon the canvas is laid.—They are thus called, to distinguish them from larger pictures drawn on walls, ceilings, &c.

EASEMENT, in law, a privilege or convenience which one neighbour has of another, whether by charter or prescription, without profit: such are a way through his lands, a sink, or the like. These, in many cases, may be claimed.

EASING, in the sea-language, signifies the slackening a rope or the like. Thus, to ease the bow-line or sheet, is to let them go slack; to ease the helm, is to let the ship go more large, more before the wind, or more larboard.

EAST, one of the four cardinal points of the world; being that point of the horizon where the sun is seen to rise when in the equinoctial.

The word *east* is Saxon. In Italy, and throughout the Mediterranean, the east wind is called the *levante*: in Greek, *ανατολη* and *ανατολης*, because it comes from the side of the sun, *ανατολη*; in Latin, *eurus*.

EASTER, a festival of the Christian church, observed in memory of our Saviour's resurrection.

The Greeks call it *pascha*, the Latins *pascha*, an Hebrew word signifying *passage*, applied to the Jewish feast of the passover. It is called *easter* in English, from the goddess *Eostre*, worshipped by the Saxons with peculiar ceremonies in the month of April.

The Asiatic churches kept their *easter* upon the very same day the Jews observed their passover, and others on the first Sunday after the first full moon in the new year. This controversy was determined in the council of Nice; when it was ordained that *easter* should be kept upon one and the same day, which should always be a Sunday, in all Christian churches in the world. For the method of finding *easter* by calculation, see *CHRONOLOGY*, n° 31.

EASTER ISLAND, an island in the South Sea, lying in N. Lat. 27. 5. W. Long. 109. 46. It is thought to have been first discovered in 1686 by one DAVIS an Englishman, who called it *Davis's Land*. It was next visited by Commodore Roggewein, a Dutchman, in 1722; who gave it the name of *Easter Island*, and published many fabulous accounts concerning the country and its inhabitants. It was also visited by a Spanish ship in 1770, the captain of which gave it the name of *St Carlos*. The only authentic accounts of this island, however, which have yet appeared, are those published by Captain Cook and Mr Forster, who visited it in the month of March 1774.—According to these accounts, the island is about 10 or 12 leagues in circumference, and of a triangular figure; its greatest length from north-west to south-east is about four leagues, and its greatest breadth two. The hills are so high, that they may be seen at the distance of 15 or 16 leagues. The north and east points of the island are of a considerable height; between them, on the south-east side, the shore forms an open bay, in which Captain Cook thinks the Dutch anchored in 1722. He himself an-

N° 108.

Easter-
Island.

chores on the west side of the island, three miles northward from the south point. This, he says, is a good road with easterly winds; but a dangerous one when the wind blows from the contrary quarter, as the other on the south-east side must be with easterly winds: so that there is no good accommodation to be had for shipping round the whole island.

The island itself is extremely barren; and bears evident marks not only of a volcanic origin, but of having been not very long ago entirely ruined by an eruption. As they approached the south point, Mr Forster informs us, that they observed the shore to rise perpendicularly. It consisted of broken rocks, whose cavernous appearance, and black or ferruginous colour, seemed to indicate that they had been thrown up by subterranean fire. Two detached rocks lie about a quarter of a mile off this point: one of them is singular on account of its shape, and represents a huge column or obelisk; and both these rocks were inhabited by multitudes of sea-fowls. On landing and walking into the country, they found the ground covered with rocks and stones of all sizes, which appeared to have been exposed to a great fire, where they seemed to have acquired a black colour and porous texture. Two or three thrivelled species of grasses grew among these stones, and in some measure softened the desolate appearance of the country. The farther they advanced, the more ruinous the face of the country seemed to be. The roads were intolerably rugged, and filled with heaps of volcanic stones, among which the Europeans could not make their way but with the greatest difficulty; but the natives leaped from one stone to another with surprising agility and ease. As they went northward along the island, they found the ground still of the same nature; till at last they met with a large rock of black melted lava, which seemed to contain some iron, and on which was neither soil nor grass, nor any mark of vegetation. Notwithstanding this general barrenness, however, there are several large tracts covered with cultivated soil, which produces potatoes of a gold yellow colour, as sweet as carrots, plantains, and sugar-canes. The soil is a dry hard clay; and the inhabitants use the grass which grows between the stones in other parts of the island as a manure, and for preserving their vegetables when young from the heat of the sun.

The most remarkable curiosity belonging to this island is a number of Colossian statues; of which, however, very few remain entire. These statues are placed only on the sea-coast. On the east side of the island were seen the ruins of three platforms of stone-work, on each of which had stood four of these large statues; but they were all fallen down from two of them, and one from the third: they were broken or defaced by the fall. Mr Wales measured one that had fallen, which was 15 feet in length, and fix broad over the shoulders: each statue had on its head a large cylindrical stone of a red colour, wrought perfectly round. Others were found that measured near 27 feet, and upwards of eight feet over the shoulders; and a still larger one was seen standing, the shade of which was sufficient to shelter all the party, consisting of near 30 persons, from the rays of the sun. The workmanship is rude, but not bad, nor are the features of the face ill formed; the ears are long, according to the disor-

tion

Easter-
Island.

tion practised in the country, and the bodies have hardly any thing of a human figure about them. How these islanders, wholly unacquainted with any mechanical power, could raise such stupendous figures, and afterwards place the large cylindric stones upon their heads, is truly wonderful! The most probable conjecture seems to be, that the stone is facitious; and that each figure was gradually erected, by forming a temporary platform round it, and raising it as the work advanced: but they are at any rate very strong proofs of the ingenuity and perseverance of the islanders in the age when they were built, as well as that the ancestors of the present race had seen better days than their descendants enjoy. The water of this island is in general brackish, there being only one well that is perfectly fresh, which is at the east end of the island: and whenever the natives repair to it to slake their thirst, they wash themselves all over; and if there is a large company, the first leaps into the middle of the hole, drinks, and washes himself without ceremony; after which another takes his place, and so on in succession. This custom was much disapproved by their new friends, who stood greatly in need of this valuable article, and did not wish to have it contaminated by such ablutions.

The people are of a middle size. In general they are rather thin; go entirely naked; and have punctures on their bodies, a custom common to all the inhabitants of the South Sea islands. Their greatest singularity is the size of their ears, the lobe of which is stretched out so that it almost rests on their shoulder; and is pierced with a very large hole, capable of admitting four or five fingers with ease. The chief ornaments for their ears are the white down of feathers and rings which they wear in the inside of the hole, made of the leaf of the sugar-cane, which is very elastic, and for this purpose is rolled up like a watch-spring. Some were seen clothed in the same cloth used in the island of Otaheite, tinged of a bright orange-colour with turmeric; and these our voyagers supposed to be chiefs. Their colour is a chestnut-brown; their hair black, curling, and remarkably strong; and that on the head as well as the face is cut short. The women are small, and slender-limbed: they have punctures on the face, resembling the patches sometimes used by European ladies; they paint their face all over with a reddish brown ruddle, and above this they lay a fine orange-colour extracted from turmeric-root; the whole is then variegated with streaks of white shell-lime. But the most surprising circumstance of all with regard to these people, is the apparent scarcity of women among them. The nicest calculation that could be made, never brought the number of inhabitants in this island to above 700, and of these the females bore no proportion in number to the males. Either they have but few females, or else their women were restrained from appearing during the stay of the ship; notwithstanding, the men showed no signs of a jealous disposition, or the women any scruples of appearing in public: in fact, they seemed to be neither reserved nor chaste; and the large pointed cap which they wore gave them the appearance of professed wantons. But as all the women who were seen were liberal of their favours, it is more than probable that all the married and modest ones had concealed themselves from their impetuous visitants in

some inscrutable parts of the island; and what further strengthens this supposition is, that heaps of stones were seen piled up into little hillocks, which had one steep perpendicular side, where a hole went under ground. The space within, says Mr Forster, could be but small; and yet it is probable that these cavities served, together with their miserable huts, to give shelter to the people at night; and they may communicate with natural caverns, which are very common in the lava currents of volcanic countries. The few women that appeared were the most lascivious of their sex that perhaps have been ever noticed in any country, and shame seemed to be entirely unknown to them.

EATON, a town of Buckinghamshire, situated on the north side of the Thames, opposite to Windsor, and famous for its collegiate school, founded by King Henry VI. being a seminary for King's College, Cambridge, the fellows of which are all from this school.

EAU DE CARMES. See PHARMACY.

Eau de Luce. See CHEMISTRY, n^o 1037.

EAVES, in architecture, the margin or edge of the roof of a house; being the lowest tiles, slates, or the like, that hang over the walls, to throw off water to a distance from the wall.

EAVES-DROPPERS, are such persons as stand under the eaves, or walls, and windows of a house, by night or day, to hearken after news, and carry it to others, and thereby cause strife and contention in the neighbourhood. They are called *evil members of the commonwealth* by the stat. of West. 1. c. 33. They may be punished either in the court-leet by way of presentment and fine, or in the quarter-sessions by indictment and binding to good behaviour.

EBBING OF THE TIDES. See TIDE.

EBDOMARIUS, in ecclesiastical writers, an officer formerly appointed weekly to superintend the performance of divine service in cathedrals, and prescribe the duties of each person attending in the choir, as to reading singing, praying, &c. To this purpose the ebdomary, at the beginning of his week, drew up in form a bill or writing of the respective persons, and their several offices, called *tabula*, and the persons there entered were styled *intabulati*.

EBDOME, *ἑβδομή*, in antiquity, a festival kept on the seventh of every lunar month, in honour of Apollo, to whom all seventh days were sacred, because one of them was his birth-day; whence he was sometimes called *Ebdomagenes*. For the ceremonies of this solemnity see *Potter's Archæol. Græc.* lib. ii. cap. 20.

EBENUS, the EBONY TREE: A genus of the candria order, belonging to the diadelphous class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The segments of the calyx are the length of the corolla, and the latter has scarce any alæ: there is one rough seed. There is but one species, the crotica, a native of the island of Crete, and some others in the Archipelago. It rises with a shrubby stalk three or four feet high; which puts out several side-branches garnished with hoary leaves at each joint, composed of five narrow spear-shaped lobes, which join at their tails to the footstalk, and spread out like the fingers of a hand. The branches are terminated by thick spikes of large purple flowers, which are of the butterfly or pea-bloom kind. The plants may be propagated from seeds sown in the autumn. In this country

Eaton
||
Ebenus.

Ebion,
Ebionites.

try the plants must be protected during the winter, as they are unable to bear the cold.

EBION, the author of the heresy of the EBIONITES, was a disciple of Cerinthus, and his successor. He improved upon the errors of his master, and added to them new opinions of his own. He began his preaching in Judea: he taught in Asia, and even at Rome. His tenets infected the isle of Cyprus. St John opposed both Cerinthus and Ebion in Asia; and it is thought, that this apostle wrote his gospel, in the year 97, particularly against this heresy.

EBIONITES, ancient heretics, who rose in the church in the very first age thereof, and formed themselves into a sect in the second century, denying the divinity of Jesus Christ.

Origen takes them to have been so called from the Hebrew word *ebion*, which in that language signifies *poor*; because, says he, they were poor in sense, and wanted understanding. Eusebius, with a view to the same etymology, is of opinion they were thus called, as having poor thoughts of Jesus Christ, taking him for no more than a mere man.

It is more probable the Jews gave this appellation to the Christians in general out of contempt; because in the first times there were few but poor people that embraced the Christian religion. This opinion Origen himself seems to give into, in his book against Celsus, where he says, that they called *Ebionites*, such among the Jews as believed that Jesus was truly the expected Messiah.

It might even be urged, with some probability, that the primitive Christians assumed the name themselves, in conformity to their profession. It is certain, Epiphanius observes, they valued themselves on being poor, in imitation of the apostles. The same Epiphanius, however, is of opinion, that there had been a man of the name EBION, the chief and founder of the sect of Ebionites, contemporary with the Nazarenes and Cerinthians. He gives a long and exact account of the origin of the Ebionites, making them to have risen after the destruction of Jerusalem, when the first Christians, called *Nazarenes*, went out of the fame to live at Pella.

The Ebionites are little else than a branch of Nazarenes: only that they altered and corrupted, in many things, the purity of the faith held among those first adherents to Christianity. For this reason, Origen distinguishes two kinds of Ebionites, in his answer to Celsus: the one believed that Jesus Christ was born of a virgin; and the other, that he was born after the manner of other men.

The first were orthodox in every thing, except that to the Christian doctrine they joined the ceremonies of the Jewish law, with the Jews, Samaritans, and Nazarenes; together with the traditions of the Pharisees. They differed from the Nazarenes, however, in several things, chiefly as to what regards the authority of the sacred writings; for the Nazarenes received all for scripture contained in the Jewish canon; whereas the Ebionites rejected all the prophets, and held the very names of David, Solomon, Isaiah, Jeremiah, and Ezekiel, in abhorrence. They also rejected all St Paul's epistles, whom they treated with the utmost disrespect.

They received nothing of the Old Testament but the Pentateuch; which should intimate them to have descended rather from the Samaritans than from the Jews. They agreed with the Nazarenes in using the

Hebrew gospels of St Matthew, otherwise called the Gospel of the Twelve Apostles; but they had corrupted their copy in abundance of places; and particularly, had left out the genealogy of our Saviour, which was preserved entire in that of the Nazarenes, and even in those used by the Corinthians.

Some, however, have made this gospel canonical, and of greater value than our present Greek gospel of St Matthew: See NAZARENES. These last, whose sentiments, as to the birth of our Saviour, were the same with those of the Ebionites, built their error on this very genealogy.

Beside the Hebrew gospel of St Matthew, the Ebionites had adopted several other books, under the names of St James, John, and the other apostles: they also made use of the Travels of St Peter, which are supposed to have been written by St Clement; but had altered them so, that there was scarce any thing of truth left in them. They even made that saint tell a number of falsehoods, the better to authorize their own practices. See St Epiphanius, who is very diffusive on the ancient heresy of the Ebionites, *Her. 30*. But his account deserves little credit, as, by his own confession, he has confounded the other sects with the Ebionites, and has charged them with errors to which the first adherents of this sect were utter strangers.

EBONY OF CRETE. See EBENUS.

EBONY Wood is brought from the Indies, exceedingly hard and heavy, susceptible of a very fine polish, and on that account used in mosaic and inlaid works, toys, &c. There are divers kinds of ebony: the most usual among us are black, red, and green, all of them the product of the island of Madagascar, where the natives call them indifferently *basan mainbis*, q. d. *black wood*. The island of St Maurice, belonging to the Dutch, likewise furnishes part of the ebonyes used in Europe.

Authors and travellers give very different accounts of the tree that yields the black ebony. By some of their descriptions, it should be a sort of palm-tree; by others, a cypress, &c. The most authentic of them is that of M. Placourt, who resided many years in Madagascar as governor thereof; he assures us, that it grows very high and big, its bark being black, and its leaves resembling those of our myrtle, of a deep, dusky, green colour.

Tavernier assures us, that the islanders always take care to bury their trees, when cut down, to make them the blacker, and to prevent their splitting when wrought. F. Plumier mentions another black ebony-tree, discovered by him at St Domingo, which he calls *spontium portulacæ foliis aculeatum eleni materiam*. Candia also bears a little shrub, known to the botanists under the name of *EBENUS Cretica*, above described.

Pliny and Dioscorides say the best ebony comes from Ethiopia, and the worst from India; but Theophrastus prefers that of India. Black ebony is much preferred to that of other colours. The best is a jet black, free of veins and rind, very massive, astringent, and of an acrid pungent taste. Its rind, infused in water, is said to purge pituita, and cure venereal disorders; whence Matthioli took guaiacum for a sort of ebony. It yields an agreeable perfume when laid on burning coals: when green, it readily takes fire from the abundance of its fat. If rubbed against a stone, it becomes brown. The Indians make statues of their gods, and

Ebony.

Floracum

Ecatefia.

and sceptres for their princes, of this wood. It was first brought to Rome by Pompey, after he subdued Mithridates. It is now much less used among us than anciently; since the discovery of so many ways of giving other hard woods a black colour.

As to the green ebony, besides Madagascar and St Maurice, it likewise grows in the Antilles, and especially in the isle of Tobago. The tree that yields it is very bushy; its leaves are smooth, and of a fine green colour. Beneath its bark is a white blea, about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, tho' sometimes streaked with yellow veins. Its use is not confined to mosaic work: it is likewise good in dyeing, as yielding a fine green tincture. As to red ebony, called also *grenadilla*, we know little of it more than the name.

The cabinet-makers, inlayers, &c. make pear-tree and other woods pass for ebony, by giving them the black colour thereof. This some do by a few washes of a hot decoction of galls; and when dry, adding writing ink thereon, and polishing it with a stiff brush, and a little hot wax; and others heat or burn their wood black. See DYEING.

EBORACUM (anc. geog.), a famous city of the Brigantes in Britain, the residence of Septimius Severus and Constantine Chlorus, and where they both died; a Roman colony; and the station of the *Legio Sexta Victrix*. Now York. W. Long. 50. Lat. 54. *Caer-efrock*, or *Caer-efrock*, in British (Camden).

EBRO, anciently *IBERUS*, a large river of Spain, which, taking its rise in Old Castile, runs thro' Biscay and Arragon, passes by Saragosa, and, continuing its course thro' Catalonia, discharges itself with great rapidity into the Mediterranean, about 20 miles below the city of Tortosa.

EBUDÆ, or *HEBUDÆ* (anc. geog.), islands on the west of Scotland. The ancients differ greatly as to their situation, number, and names; said in general to lie to the north of Ireland and west of Scotland. Now called the *Western Isles*, also *Hebrides*; this last a modern name, the reason of which does not appear, unless it be a corruption of *Hebrides*. By Beda called *Mennie*, an appellation equally obscure.

EBULLITION, the same with BOILING. The word is also used in a synonymous sense with EFFERVESCENCE.

EBUSUS (anc. geog.), the greater of the two islands called Pityulæ, in the Mediterranean, near the east coast of Spain, to the south-west of Majorca. Famous for its pastures for cattle, and for its figs. Now *Ivica*, 100 miles in compass, without any noxious animals but rabbits, who often destroy the corn.

ECALEſIA, *Εκαλεσία*, in antiquity, a festival kept in honour of Jupiter, surnamed *Nealeus*, or *Hecaleus*, from *Heale*, one of the borough-towns in Attica.

ECASTOR, in antiquity, an oath wherein Castor was invoked. It was a custom for the men never to swear by Castor, nor the women by Pollux.

ECATEA, *Εκαταία*, in antiquity, statues erected to the goddesses Hecate, for whom the Athenians had a great veneration, believing that she was the overseer of their families, and that she protected their children.

ECATESIA, *Εκατησία*, in antiquity, an anniversary solemnity, observed by the Stratoniceusians, in honour

of Hecate. The Athenians likewise had a public entertainment or supper every new moon, in honour of the same goddess. The supper was provided at the charge of the richer sort; and was no sooner brought to the accustomed place but the poor people carried all off, giving out that Hecate had devoured it. For the rest of the ceremonies observed on this occasion, see *Pott. Arch. Grec. lib. ii. cap. 20.*

ECATOMBAÏON, *Εκατομβαιον*, in chronology, the first month of the Athenian year. It consisted of 30 days, and began on the first new moon after the summer solstice, and consequently answered to the latter part of our June and beginning of July. The Boeotians called it *Hippodromus*, and the Macedonians *Lous*. See MONTH. The word is a derivative from the Greek *κατομβή*, a *hecatomb*, because of the great number of hecatombs sacrificed in it.

ECAVESSADE, in the manege, is used for a jerk of the cavesson.

ECBATANA (anc. geog.), the royal residence and the capital of Media, built by Deioeces king of the Medes, according to Herodotus; Pliny says, by Seleucus; but that could not be, because it is mentioned by Demolthenes. It was situated on a gentle declivity, distant 12 stadia from Mount Orontes, and was in compass 150 stadia. Here stood the royal treasury and tombs. It was an open unwall'd town, but had a very strong citadel, encompassed with seven walls, one within and rising above another. The extent of the utmost was equal to the whole extent of Athens, according to Herodotus; the situation favouring this construction, as being a gentle ascent, and each wall was of a different colour.—Another *Ecbatana* of Persia, a town of the Magi (Pliny).—A third of Syria.

ECCENTRICITY. See EXCENTRICITY.

ECHELLENSIS (Abraham), a learned Maronite, whom the president le Jai employed in the edition of his Polyglott Bible. Gabriel Sionita, his countryman, drew him to Paris, in order to make him his fellow-labourer in publishing that bible. They fell out: Gabriel complained to the parliament, and cruelly defamed his associate; their quarrel made a great noise. The congregation of *propaganda fide* associated him, 1636, with those whom they employed in making an Arabic translation of the scripture. They recalled him from Paris, and he laboured in that translation at Rome in the year 1652. While he was professor of the Oriental languages at Rome, he was pitched upon by the great duke Ferdinand II. to translate from Arabic into Latin the 5th, 6th, and 7th books of Apollonius's Conics; in which he was assisted by John Alphonso Borelli, who added commentaries to them. He died at Rome in 1664.

ECCHYMOSIS, from *εκχυνω* to pour out, or from *εκ* out, and *χυμος* juice. It is an effusion of humours from their respective vessels, under the integuments; or, as Paulus Aegineta says, "When the flesh is bruised by the violent collision of any object, and its small veins broken, the blood is gradually discharged from them." This blood, when collected under the skin, is called an *ecchymosis*, the skin in the mean time remaining entire; sometimes a tumor is formed by it, which is soft and livid, and generally without pain. If the quantity of blood is not considerable, it is usually reformed; if much, it suppurates: it rarely happens

Ecatom-
bazon

Ecchym-
osis.

Ecclesiastical Courts. that any further inconvenience follows; though, in case of a very bad habit of body, a mortification may be the result, and in such a case regard must be had thereto.

ESCLAIRCISSEMENT. See ESCLAIRCISSEMENT.

ECCLASIASTES, a canonical book of the Old Testament, the design of which is to show the vanity of all sublunary things.

It was composed by Solomon; who enumerates the several objects on which men place their happiness, and then shows the insufficiency of all worldly enjoyments.

The Talmudists made king Hezekiah to be the author of it; Grotius ascribes it to Zorobabel, and others to Isaiah; but the generality of commentators believe this book to be the produce of Solomon's repentance, after having experienced all the follies and pleasures of life.

ECCLASIASTICAL, an appellation given to whatever belongs to the church: thus we say, ecclesiastical polity, jurisdiction, history, &c.

ECCLASIASTICAL Courts. In the time of the Anglo-Saxons there was no sort of distinction between the lay and the ecclesiastical jurisdiction: the county-court was as much a spiritual as a temporal tribunal: the rights of the church were ascertained and asserted at the same time, and by the same judges, as the rights of the laity. For this purpose the bishop of the diocese, and the alderman, or in his absence the sheriff of the county, used to sit together in the county-court, and had there the cognizance of all causes as well ecclesiastical as civil; a superior deference being paid to the bishop's opinion in spiritual matters, and to that of the lay-judges in temporal. This union of power was very advantageous to them both: the presence of the bishop added weight and reverence to the sheriff's proceedings; and the authority of the sheriff was equally useful to the bishop, by enforcing obedience to his decrees in such refractory offenders as would otherwise have despised the thunder of mere ecclesiastical censures.

But so moderate and rational a plan was wholly inconsistent with those views of ambition that were then forming by the court of Rome. It soon became an established maxim in the papal system of policy, that all ecclesiastical persons, and all ecclesiastical causes, should be solely and entirely subject to ecclesiastical jurisdiction only: which jurisdiction was supposed to be lodged in the first place and immediately in the Pope, by divine indefeasible right and investiture from Christ himself, and derived from the Pope to all inferior tribunals. Hence the canon law lays it down as a rule, that "*sacerdotes a regibus honorandi sunt, non iudicandi*," and places an emphatical reliance on a fabulous tale which it tells of the emperor Constantine, That when some petitions were brought to him, imploring the aid of his authority against certain of his bishops accused of oppression and injustice, he caused (says the holy canon) the petitions to be burnt in their presence, dismissing them with this valediction: "*Ita, et inter vos causas vestras discutite, quia dignum non est ut nos iudicemus Deos.*"

It was not, however, till after the Norman conquest, that this doctrine was received in England; when Wil-

liam I. (whose title was warmly espoused by the monasteries which he liberally endowed, and by the foreign clergy whom he brought over in shoals from France and Italy, and planted in the best preferments of the English church), was at length prevailed upon to establish this fatal encroachment, and separate the ecclesiastical court from the civil: whether actuated by principles of bigotry, or by those of a more refined policy, in order to discountenance the laws of king Edward abounding with the spirit of Saxon liberty, is not altogether certain. But the latter, if not the cause, was undoubtedly the consequence, of this separation: for the Saxon laws were soon overborne by the Norman judicaries, when the county-court fell into disregard by the bishop's withdrawing his presence, in obedience to the charter of the conqueror; which prohibited any spiritual cause from being tried in the secular courts, and commanded the suitors to appear before the bishop only, whose decisions were directed to conform to the canon law.

King Henry I. at his accession, among other restorations of the laws of king Edward the Confessor, revived this of the union of the civil and ecclesiastical courts. Which was, according to Sir Edward Coke, after the great heat of the conquest was past, only a restitution of the ancient law of England. This however was ill relished by the Popish clergy, who, under the guidance of that arrogant prelate archbishop Anselm, very early disapproved of a measure that put them on a level with the profane laity, and subjected spiritual men and causes to the inspection of the secular magistrates: and therefore, in their synod at Westminster, 3 Hen. I. they ordained, that no bishop should attend the discussion of temporal causes; which soon dissolved this newly effected union. And when, upon the death of king Henry I. the usurper Stephen was brought in and supported by the clergy, we find one article of the oath which they imposed upon him was, that ecclesiastical persons and ecclesiastical causes should be subject only to the bishop's jurisdiction. And as it was about that time that the contest and emulation began between the laws of England and those of Rome, the temporal courts adhering to the former, and the spiritual adopting the latter, as their rule of proceeding; this widened the breach between them, and made a coalition afterwards impracticable; which probably would else have been effected at the general reformation of the church.

Ecclesiastical Courts are various; as the ARCHDEACON'S, the CONSISTORY, the COURT OF ARCHES, the PECULIARS, the PREROGATIVE, and the great court of appeal in all ecclesiastical causes, viz. the COURT OF DELEGATES. See these articles.

As to the method of proceeding in the spiritual courts, it must (in the first place) be acknowledged to their honour, that though they continue to this day to decide many questions which are properly of temporal cognizance, yet justice is in general so ably and impartially administered in those tribunals (especially of the superior kind), and the boundaries of their power are now so well known and established, that no material inconvenience at present arises from this jurisdiction still continuing in the ancient channel. And, should any alteration be attempted, great confusion would probably arise, in overturning long established forms,

Blackf.
Comment.

Blackf.
Comment.

forms, and new-modelling a course of proceedings that has now prevailed for seven centuries.

The establishment of the civil-law process in all the ecclesiastical courts was indeed a matter-piece of papal discernment, as it made a coalition impracticable between them and the national tribunals, without manifest inconvenience and hazard. And this consideration had undoubtedly its weight in causing this measure to be adopted, though many other causes concurred. In particular, it may be here remarked, that the pandects, or collections of civil law, being written in the Latin tongue, and referring so much to the will of the prince and his delegated officers of justice, sufficiently recommended them to the court of Rome, exclusive of their intrinsic merit. To keep the laity in the darkest ignorance, and to monopolize the little science which then existed entirely among the monkish clergy, were deep-rooted principles of papal policy. And as the bishops of Rome affected in all points to mimic the imperial grandeur, as the spiritual prerogatives were moulded on the pattern of the temporal, so the canon-law process was formed on the model of the civil law; the prelates embracing, with the utmost ardor, a method of judicial proceedings, which was carried on in a language unknown to the bulk of the people, which banished the intervention of a jury (that bulwark of Gothic liberty), and which placed an arbitrary power of decision in the breast of a single man.

The proceedings in the ecclesiastical courts are therefore regulated according to the practice of the civil and canon laws; or rather to a mixture of both, corrected and new-modelled by their own particular usages, and the interposition of the courts of common law. For, if the proceedings in the spiritual court be ever so regularly consonant to the rules of the Roman law, yet if they be manifestly repugnant to the fundamental maxims of the municipal laws, to which, upon principles of sound policy, the ecclesiastical process ought in every state to conform (as if they require two witnesses to prove a fact, where one will suffice at common law); in such cases, a prohibition will be awarded against them. But, under these restrictions, their ordinary course of proceeding is, first, by *citation*, to call the party injuring before them. Then by *libel* (*libellus*, "a little book"), or by articles drawn out in a formal *allegation*, to set forth the complainant's ground of complaint. To this succeeds the *defendant's answer* upon oath; when, if he denies or extenuates the charge, they proceed to *proofs* by witnesses examined, and their depositions taken down in writing by an officer of the court. If the defendant has any circumstances to offer in his defence, he must also propound them in what is called his *defensive allegation*, to which he is intitled in his turn to the *plaintiff's answer* upon oath, and may from thence proceed to *proofs* as well as his antagonist. The canonical doctrine of *purgation*, whereby the parties were obliged to answer upon oath to any matter, however criminal, that might be objected against them (though long ago over-ruled in the court of chancery, the genius of the English law having broken through the bondage imposed on it by its clerical chancellors, and asserted the doctrines of judicial as well as civil liberty), continued till the middle of the last century, to be upheld by the spiritual courts; when the legislature was obliged to interpose, to teach them

a lesson of similar moderation. By the statute of Ecclesiastical 13 Car. II. c. 12. it is enacted, that it shall not be lawful for any bishop, or ecclesiastical judge, to tender or administer to any person whatsoever, the oath usually called the oath *ex officio*, or any other oath whereby he may be compelled to confess, accuse, or purge himself of any criminal matter or thing, whereby he may be liable to any censure or punishment. When all the pleadings and proofs are concluded, they are referred to the consideration, not of a jury, but of a single judge; who takes information by hearing advocates on both sides, and thereupon forms his *interlocutory decree* or *definitive sentence*, at his own discretion: from which there generally lies an *appeal*, in the several stages mentioned in the articles above referred to; though if the same be not appealed from him in 15 days, it is final, by the statute 25 Hen. VIII. c. 19.

But the point in which these jurisdictions are the most defective, is that of enforcing their sentences when pronounced; for which they have no other process but that of *excommunication*; which would be often despised by obdurate or profligate men, did not the civil law step in with its aid. See EXCOMMUNICATION.

ECCELESIASTICAL Corporations, are where the members that compose them are spiritual persons. They were erected for the furtherance of religion and perpetuating the rights of the church. See CORPORATIONS.

ECCELESIASTICAL State. See CLERGY.

ECCELESIASTICUS; an apocryphal book, generally bound up with the scriptures, so called, from its being read in the church, *ecclesia*, as a book of piety and instruction, but not of infallible authority.

The author of this book was a Jew, called *Jesus the son of Sirach*. The Greeks call it the *Wisdom of the son of Sirach*.

ECCOPROTICS, in medicine, laxative or loosening remedies, which purge gently, by softening the humours and excrements, and fitting them for expulsion. — The word is composed of the Greek particle *ec*, and *protos* excrement.

ECDICI, *Exdici*, among the ancients, patrons of cities, who defended their rights, and took care of the public money. Their office resembled that of the modern syndics.

ECHAPÉ, in the manege, a horse begot between a stallion and a mare of different breeds and countries.

ECHAPER, in the manege, a gallicism used in the academies implying to give a horse head, or to put on at full speed.

ECHENEIS, the REMORA, in ichthyology; a genus belonging to the order of thoracici. The head is fat, naked, depressed, and marked with a number of transverse ridges; it has ten rays in the branchiostegic membrane; and the body is naked. There are two plate species, viz. 1. The remora, or sucking-fish, with a CLXXIII. forked tail, and 18 finæ on the head. It is found in the Indian ocean. 2. The neurates, with an undivided tail, and 16 finæ on the head. It is likewise a native of the Indian ocean. These fishes are often found adhering so strongly to the sides of sharks and other great fish, by means of the structure of its head, as to be got off with difficulty. This fish was believed, by all the ancients, to have most wonderful powers, and to be able, by adhering to the bottom, to arrest the

Echevin

Echevins

the motion of a ship in its fullest course; and in love affairs, to deaden the warmest affections of both sexes (*Plin. lib. ix. c. 25.*).

ECHÉVIN, in the French and Dutch polity, a magistrate elected by the inhabitants of a city or town, to take care of their common concerns, and the decoration and cleanliness of the city.

At Paris, there is a prévôt and four echevins; in other towns, a mayor and echevins. At Amsterdam, there are nine echevins; and at Rotterdam, seven.

In France, the echevins take cognizance of rents, taxes, and the navigation of rivers, &c. In Holland, they judge of civil and criminal causes; and if the criminal confesses himself guilty, they can see their sentence executed without appeal.

ECHINATE, or ECHINATED, an appellation given to whatever is prickly, thereby resembling the hedgehog.

ECHINITES, in natural history, the name by which authors call the fossil centrotia, frequently found in our chalk-pits. See CENTRONIA.

ECHINOPHORA, in botany: A genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellata*. The male florets are lateral, with the central one hermaphrodite; there is one seed, sunk into an indurated involucreum.

ECHINOPS, in botany: A genus of the polygamia segregata order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Composita*. The calyx is unilobed; the corollula tubulated, and hermaphrodite; the receptacle bristly; the pappus indistinct.

ECHINUS, in zoology, a genus of insects belonging to the order of vermes mollusca. The body is roundish, covered with a bony crust, and often beset with moveable prickles; and the mouth is below, and consists of five valves. 1. The esculentus, or eatable echinus, is of a hemispherical form, covered with sharp strong spines, above half an inch long; commonly of a violet colour; moveable; adherent to small tubercles elegantly disposed in rows. These are their instruments of motion by which they change their place. This species is taken in dredging, and often lodges in cavities of rocks just within low water mark. They are eaten by the poor in many parts of England, and by the better sort abroad. In old times they were a favourite dish. They were dressed with vinegar, honied wine or mead, parsley or mint; and thought to agree with the stomach. They were the first dish in the famous supper of Lentulus, when he was made *flamen Martialis*, or priest of Mars. By some of the concomitant dishes, they seem to have been designed as a whet for the second course, to the holy personages, priests and vestals invited on that occasion. Many species of shell-fish made part of that entertainment. 2. The lacunosus, or oval echinus, is of an oval depressed form; on the top it is of a purple colour, marked with a quadrefoil, and the spaces between tuberculated in waved rows; the lower side fluted, and divided by two smooth spaces. Length, four inches. When clothed, it is covered with short thickset bristles mixed with very long ones. There are 15 other species, all natives of the sea. See two specimens delineated on Plate CLXXIII.

ECHINUS, in architecture, a member or ornament near the bottom of the Ionic, Corinthian, and Composite capitals.

ECHITES, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 30th order, *Contorta*. There are two long and straight foliaceous; the seeds pappous; the corolla funnel-shaped, with the throat naked. The corymbosa, a species of this genus, is supposed to yield the elastic gum according to Jaquein. See CAOUTCHOUC.

ECHIUM, VIPER'S BUGLOSS, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 41st order, *Asperifolia*. The corolla is irregular, with the throat naked. There are seven species, three of which are natives of Britain. None of them have any remarkable property, except that the flowers of one species (the vulgar) are very grateful to bees. It is a native of many parts of Britain. The stem is rough with hairs and tubercles. The leaves are spear-shaped, and rough with hair. The flowers come out in lateral spikes. They are first red, afterwards blue; sometimes purple or white.—Cows and sheep are not fond of the plant; horses and goats refuse it.

ECHO, or ЕССНО, a sound reflected or reverberated, from a solid, concave, body, and so repeated to the ear*. The word is formed from the Greek *ἠχώ** See *Acoustics*, p. 25.

The ancients being wholly unacquainted with the true cause of the echo, ascribed it to several causes sufficiently whimsical. The poets, who were not the worst of their philosophers, imagined it to be a person of that name metamorphosed, and that she perfected to take up her abode in particular places; for they found by experience, that she was not to be met with in all. (See below, Echo in *fabulous history*.) But the moderns, who know sound to consist in a certain tremor or vibration in the sonorous body communicated to the contiguous air, and by that means to the ear, give a more consistent account of echo.

For a tremulous body, striking on another solid body, it is evident, may be repelled without destroying or diminishing its tremor; and consequently a sound may be redoubled by the reflection of the tremulous body, or air.

But a simple reflexion of the sonorous air, is not enough to solve the echo: for then every plain surface of a solid hard body, as being fit to reflect a voice or sound, would redouble it; which we find does not hold.

To produce an echo, therefore, it should seem that a kind of concavation or vaulting were necessary, in order to collect, and by collecting to heighten and increase, and afterwards reflect, the sound; as we find is the case in reflecting the rays of light, where a concave mirror is required.

In effect, as often as a sound strikes perpendicularly on a wall, behind which is any thing of a vault or arch, or even another parallel wall; so often will it be reverberated in the same line, or other adjacent ones.

For an echo to be heard, therefore, it is necessary the ear be in the line of reflection: for the person who made the sound to hear its echo, it is necessary he be

Echinus

Echo

Echo.

perpendicular to the place which reflects it: and for a manifold or tautological echo, it is necessary there be a number of walls, and vaults or cavities, either placed behind or fronting each other.

A single arch or concavity, &c. can scarce ever stop and reflect all the found; but if there be a convenient disposition behind it, part of the found-propagated thither, being collected and reflected as before, will present another echo: or, if there be another concavity, opposed at a due distance to the former, the found reflected from the one upon the other will be tossed back again by this latter, &c.

Many of the phenomena of echos are well considered by the bishop of Leighs, &c. who remarks, that any found, falling either directly or obliquely on any dense body of a smooth, whether plain or arched, superficies, is reflected, or echos, more or less. The surface, says he, must be smooth; otherwise the air, by reverberation, will be put out of its regular motion, and the found thereby broken and extinguished. He adds, that it echos more or less, to show, that when all things are as before described, there is still an echoing, tho' it be not always heard; either because the direct found is too weak to beat quite back again to him that made it; or that it does return to him, but so weak, that it cannot be discerned; or that he stands in a wrong place to receive the reflected found, which passes over his head, under his feet, or on one side of him; and which therefore may be heard by a man standing in the place where the reflected found does come, provided no interposed body intercepts it, but not by him that first made it.

Echos may be produced with different circumstances. For, 1. A *plane* obstacle reflects the found back in its due tone and loudness; allowance being made for the proportionable decrease of the found, according to its distance.

2. A *convex* obstacle reflects the found somewhat smaller and somewhat quicker, though weaker, than otherwise it would be.

3. A *concave* obstacle echos back the found, bigger, slower, and also inverted; but never according to the order of words.

Nor does it seem possible to contrive any single echo, that shall invert the found, and repeat backwards; because, in such case, the word last spoken, that is, which last occurs to the obstacle, must be repelled first; which cannot be. For where in the mean time should the first words hang and be concealed; or how, after such a pause, be revived, and animated again into motion?

From the determinate concavity or archness of the reflecting bodies, it may happen that some of them shall only echo back one determinate note, and only from one place.

4. The echoing body being removed farther off, it reflects more of the found than when nearer; which is the reason why some echos repeat but one syllable, some one word, and some many.

5. Echoing bodies may be so contrived and placed, as that reflecting the found from one to the other, either directly and mutually, or obliquely and by succession, out of one found, a multiple echo or many echos shall arise.

Add, that a multiple echo may be made, by so placing the echoing bodies at unequal distances, that

they may reflect all one way, and not one on the other; by which means, a manifold successive found will be heard; one clap of the hands, like many; one *ha*, like a laughter; one single word, like many of the same tone and accent; and so one viol, like many of the same kind, imitating each other.

Lastly, echoing bodies may be so ordered, that from any one found given, they shall produce many echos different both as to tone and intention. By which means a musical room may be so contrived, that not only one instrument playing therein shall seem many of the same sort and size, but even a concert of different ones, only by placing certain echoing bodies so, that any note played shall be returned by them in 3ds, 5ths, and 8ths.

Echo, is also used for the place where the repetition of the found is produced or heard.

Echos are distinguished into divers kinds, *viz.*

1. *Single*, which return the voice but once. Whereof some are *tonical*, which only return a voice when modulated into some particular musical tone: Others, *polysyllabical*, which return many syllables, words, and sentences. Of this last kind is that fine echo in Woodstock-park, which Dr Plot assures us, in the day-time, will return very distinctly seventeen syllables, and in the night twenty.

2. *Multiple, or tautological*; which return syllables and words the same oftentimes repeated.

In echos, the place where the speaker stands is called the *centrum phonicum*; and the object or place that returns the voice, the *centrum phonocaptivum*.

At the sepulchre of Metella, wife of Crassus, was an echo, which repeated what a man said five times. Authors mention a tower at Cyzicus, where the echo repeated seven times. One of the finest echos we read of is that mentioned by Barthius, in his notes on Stratus's *Thebais*, lib. vi. 30. which repeated the words a man uttered 17 times: it was on the banks of the Nalis, between Coblenz and Bingen. Barthius assures us, he had proved what he writes; and had told 17 repetitions. And whereas, in common echos, the repetition is not heard till some time after hearing the word spoke, or the notes sung; in this, the person who speaks or sings is scarce heard at all; but the repetition most clearly, and always in surprising varieties; the echo seeming sometimes to approach nearer, and sometimes to be further off. Sometimes the voice is heard very distinctly, and sometimes scarce at all. One hears only one voice, and another several: one hears the echo on the right, and the other on the left, &c. At Milan in Italy, is an echo which reiterates the report of a pistol 56 times; and if the report is very loud, upwards of 60 repetitions may be counted. The first 20 echos are pretty distinct; but as the noise seems to fly away, and answer at a greater distance, the reiterations are so doubled, that they can scarce be counted. See an account of a remarkable echo under the article PAISLEY.

ECHO, in architecture, a term applied to certain kinds of vaults and arches, most commonly of the elliptic and parabolic figures, used to redouble sounds, and produce artificial echos.

ECHO, in poetry, a kind of composition wherein the last words or syllables of each verse contains some meaning, which, being repeated apart, answers to some question

Echo.

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sion or other matter contained in the verse; as in this beautiful one from Virgil:

*Crudelis mater magis, an puer improbus illi?
Improbus ille puer, crudelis tu quoque mater.*

The elegance of an echo consists in giving a new sense to the last words; which reverberate, as it were, the motions of the mind, and by that means affect it with surprise and admiration.

ECHO, in fabulous history, a daughter of the Air and Tellus, who chiefly resided in the vicinity of the Cephissus. She was once one of Juno's attendants, and became the confidant of Jupiter's amours. Her loquacity however displeased Jupiter, and she was deprived of the power of speech by Juno, and only permitted to answer to the questions which were put to her. Pan had formerly been one of her admirers, but he never enjoyed her favours. Echo, after she had been punished by Juno, fell in love with Narcissus; but being despised by him, pined herself to death, having nothing but her voice left.

ECHOMETER, among musicians, a kind of scale or rule, with several lines thereon, serving to measure the duration and length of sounds, and to find their intervals and ratios.

ECHOUERIES. See under TRICHESUS.

ECKIUS (John), an eminent and learned divine, professor in the university of Ingoldstadt, memorable for the opposition he gave to Luther, Melancthon, Carolostadius, and other leading Protestants in Germany. He wrote many polemical tracts; and among the rest, a *Manual of Controversies*, printed in 1535, in which he discourses upon most of the heads contested between the Protestants and Papists. He was a man of uncommon learning, parts, and zeal, and died in 1543.

ELECTICS (*eclectici*), a name given to some ancient philosophers, who, without attaching themselves to any particular sect, took what they judged good, and solid, from each. Hence their denomination; which, in the original Greek, signifies, "that may be chosen," or "that chooses;" of the verb *ἐκλέγω* I choose.—Laertius notes, that they were also, for the same reason, denominated *analogetici*; but that they call themselves *Philalethes*, i. e. lovers of truth.

The chief or founder of the eclecticci was one Ptolemy of Alexandria, who lived under Augustus and Tiberius; and who, weary of doubting of all things with the Sceptics and Pyrrhonians, formed the eclectic sect; which Vossius calls the *eclective*.

Towards the close of the second century a sect arose in the Christian church under the denomination of *Eclectici*, or modern *Platonici*. They professed to make truth the only object of their enquiry, and to be ready to adopt from all the different systems and sects, such tenets as they thought agreeable to it. However, they preferred Plato to the other philosophers, and looked upon his opinions concerning God, the human soul, and things invisible, as conformable to the spirit and genius of the Christian doctrine. One of the principal patrons of this system was Ammonius Saccas, who at this time laid the foundation of that sect, afterwards distinguished by the name of the new *Platonici*, in the Alexandrian school. See AMMONIUS and PLATONISTS.

ECLECTICS were also a certain set of physicians among the ancients, of whom Archigenes, under Trajan, was the chief, who selected from the opinions of all the other sects, that which appeared to them best and most rational; hence they were called *eclectici*, and their prescriptions *medicina eclectica*.

ECLIPSE, in astronomy, the deprivation of the light of the sun, or of some heavenly body, by the interposition of another heavenly body between our sight and it. See ASTRONOMY-Index.

ECLIPTA, in botany; a genus of the polygamia superflua order, belonging to the syngenesia class of plants. The receptacle is chaffy; there is no pappus, and the corollulae of the disk quadrifid.

ECLIPTIC, in astronomy, a great circle of the sphere, supposed to be drawn through the middle of the zodiac, making an angle with the equinoctial of about 23° 30', which is the sun's greatest declination; or, more strictly speaking, it is that path or way among the fixed stars, that the earth appears to describe to an eye placed in the sun. See ASTRONOMY-Index.

Some call it *via Solis*, "the way of the sun;" because the sun in his apparent annual motion never deviates from it, as all the other planets do more or less.

ECLIPTIC, in geography, a great circle on the terrestrial globe, not only answering to, but falling within, the plane of the celestial ecliptic. See GEOGRAPHY.

ECLOGUE, in poetry, a kind of pastoral composition, wherein shepherds are introduced conversing together. The word is formed from the Greek *ἐκλογή* choice; so that, according to the etymology, *eclogue* should be no more than a select or choice piece; but custom has determined it to a farther signification, viz. a little elegant composition in a simple natural style and manner.

Idyllion and eclogue, in their primary intention, are the same thing: thus, the idyllia, *ἰδυλλίαι*, of Theocritus, are pieces wrote perfectly in the same vein with the *eclogæ* of Virgil. But custom has made a difference between them, and appropriated the name *eclogue* to pieces wherein shepherds are introduced speaking; *idyllions*, to those wrote like the eclogue, in a simple natural style, but without any shepherds in them.

ECLUSE, a small but strong town of the Dutch Low Countries, in the county of Flanders, with a good harbour and sluices. The English besieged it in vain in 1405, and the people of Bruges in 1436. But the Dutch, commanded by Count Maurice of Nassau, took it in 1644. It is defended by several forts, and stands near the sea. E. Long. 3. 10. N. Lat. 50. 25.

ECPHRACTICS, in medicine, remedies which attenuate and remove obstructions. See ATTENUANTS, and DEOBSTRUENTS.

ECSTASY. See EXTASY.

ECSTATICI, *ἑκστατικοί*, from *ἐκστασις* I am entranced, in antiquity, a kind of diviners who were cast into trances or ecstasies, in which they lay like dead men, or asleep, deprived of all sense and motion; but, after some time, returning to themselves, gave strange relations of what they had seen and heard.

ECTHESIS, in church-history, a confession of faith, in the form of an edict, published in the year 639, by the emperor Heraclius, with a view to pacify the troubles occasioned by the Eutychian heresy in the eastern church. However, the same prince revoked it,

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on being informed that pope Severinus had condemned it, as favouring the Monothelites; declaring at the same time, that Sergius, patriarch of Constantinople, was the author of it.

ECTHLIPISIS, among Latin grammarians, a figure of prosody whereby the *m* at the end of a word, when the following word begins with a vowel, is elided, or cut off, together with the vowel preceding it, for the sake of the measure of the verse: thus they read *mult' ille*, or *multum ille*.

ECTROPIUM, in surgery, is when the eye-lids are inverted, or retracted, so that they show their internal or red surface, and cannot sufficiently cover the eye.

ECTYLOTICS, in pharmacy, remedies proper for consuming callosities.

ECU, or ESCU, a French crown; for the value of which, see MONEY.

EDDA, in antiquities, is a system of the ancient Icelandic or Runic mythology, containing many curious particulars of the theology, philosophy, and manners, of the northern nations of Europe; or of the Scandinavians, who had migrated from Asia, and from whom our Saxon ancestors were descended. Mr Mallet apprehends that it was originally compiled, soon after the Pagan religion was abolished, as a course of poetical lectures, for the use of such young Icelanders as devoted themselves to the profession of a *scald* or poet. It consists of two principal parts; the first containing a brief system of mythology, properly called the *Edda*; and the second being a kind of art of poetry, and called *scalds* or *poetics*. The most ancient Edda was compiled by Soemund Sigfusson, surnamed the *Learned*, who was born in Iceland about the year 1057. This was abridged, and rendered more easy and intelligible about 120 years afterwards, by Snorro Sturleson, who was supreme judge of Iceland in the years 1215 and 1222; and it was published in the form of a dialogue. He added also the second part in the form of a dialogue, being a detail of different events transacted among the divinities. The only three pieces that are known to remain of the more ancient Edda of Soemund, are the *Voluspá*, the *Havamaal*, and the *Runic* chapter. The *Voluspá*, or prophecy of *Vola* or *Fola*, appears to be the text, on which the Edda is the comment. It contains in two or three hundred lines the whole system of mythology, disclosed in the Edda, and may be compared to the Sibylline verses, on account of its laconic yet bold style, and its imagery and obscurity. It is professedly a revelation of the decrees of the Father of nature, and the actions and operations of the gods. It describes the chaos, the formation of the world, with its various inhabitants, the function of the gods, their most signal adventures, their quarrels with *Loke* their great adversary, and the vengeance that ensued; and concludes with a long description of the final state of the universe, its dissolution and conflagration, the battle of the inferior deities, and the evil beings, the renovation of the world, the happy lot of the good, and the punishment of the wicked. The *Havamaal*, or Sublime Discourse, is attributed to the god *Odin*, who is supposed to have given these precepts of wisdom to mankind; it is comprised in about 120 stanzas, and resembles the book of Proverbs. Mr Mallet has given fe-

veral extracts of this treatise on the Scandinavian ethics. The Runic chapter contains a short system of ancient magic, and especially of the enchantments wrought by the operation of Runic characters, of which Mr Mallet has also given a specimen. A manuscript copy of the Edda of Snorro is preserved in the library of the university of Upsal; the first part of which hath been published with a Swedish and Latin version by M. Goranfon. The Latin version is printed as a supplement to M. Mallet's Northern Antiquities. The first edition of the Edda was published by Resenius, professor at Copenhagen, in a large quarto volume, in the year 1665; containing the text of the Edda, a Latin translation by an Icelandic priest, a Danish version, and various readings from different MSS. M. Mallet has also given an English translation of the first part, accompanied with remarks; from which we learn, that the Edda teaches the doctrine of the Supreme, called the *Universal Father*, and *Odin*, who lives for ever, governs all his kingdom, and directs the great things as well as the small; who formed the heaven, earth, and air; made man, and gave him a spirit or soul, which shall live, after the body shall have mouldered away; and then all the just shall dwell with him in a place *Gimle* or *Vingolf*, the palace of friendship; but wicked men shall go to *Hela*, or death, and from thence to *Niflheim*, or the abode of the wicked, which is below in the ninth world. It inculcates also the belief of several inferior gods and goddesses, the chief of whom is *Frigga* or *Frea*, i. e. *lady*, meaning hereby the earth, who was the spouse of *Odin* or the Supreme God; whence we may infer that, according to the opinion of these ancient philosophers, this *Odin* was the active principle or soul of the world, which uniting itself with matter, had thereby put it into a condition to produce the intelligences or inferior gods, and men and all other creatures. The Edda likewise teaches the existence of an evil being called *Loke*, the calumniator of the gods, the artificer of fraud, who surpasses all other beings in cunning and perfidy. It teaches the creation of all things out of an abyss or chaos; the final destruction of the world by fire; the absorption of the inferior divinities, both good and bad, into the bosom of the grand divinity, from whom all things proceeded, as emanations of his essence, and who will survive all things; and the renovation of the earth in an improved state.

EDDISH, or EADISH, the latter pasture or grass that comes after mowing or reaping; otherwise called *eagras* or *eaybs*, and *etch*.

EDDOES or EDDERS, in botany; the American name of the *ARUM* *esulentum*.

EDDY (Saxon), of *ed* "backward," and *ea* "water," among seamen, is where the water runs back contrary to the tide; or that which hinders the free passage of the stream, and so causes it to return again. That eddy water which falls back, as it were, on the rudder of a ship under sail, the seamen call the *dead water*.

EDDR-Wind is that which returns or is beat back from a sail, mountain, or any thing that may hinder its passage.

EDELINCK (Gerard), a famous engraver, born at Antwerp, where he was instructed in drawing and engraving.

Edelnick
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Edginges.

engraving. He settled at Paris, in the reign of Louis XIV. who made him his engraver in ordinary. Edelnick was also counsellor in the Royal Academy of Painting. His works are particularly esteemed for the neatness of the engraving, their brilliant cast, and the prodigious ease apparent in the execution; and to this facility is owing the great number of plates we have of his; among which are excellent portraits of a great number of illustrious men of his time. Among the most admired of his prints, the following may be specified as holding the chief place. 1. A Battle between four Horsemen, with three figures lying slain upon the ground, from Leonardo da Vinci. 2. A holy Family, with Elizabeth, St John, and two Angels, from the famous picture of Raphael in the king of France's collection. The first impressions are before the arms of M. Colbert were added at the bottom of the plate; the second are with the arms; and in the third the arms are taken out, but the place where they had been inserted is very perceptible. 3. Mary Magdalen bewailing her sins, and trampling upon the riches of the world, from Le Brun. The first impressions are without the narrow border which surrounds the print. 4. Alexander entering into the Tent of Darius, a large print on two plates, from Le Brun. This engraving belongs to the three battles, and triumphal entry of Alexander into Babylon, by Girard Audran, and completes the set. The first impressions have the name of *Geyton* the printer at the bottom. 5. Alexander entering into the Tent of Darius (finished by P. Drevet), from Peter Mignard. Edelnick died in 1707, in an advanced age, at the Hotel Royal at the Gobelins, where he had an apartment. He had a brother named *John*, who was a skilful engraver, but died young.

EDEN (Moses), the name of a country, with a garden, in which the progenitors of mankind were settled by God himself: The term denotes pleasure or delight. It would be endless to recount the several opinions concerning its situation, some of them very wild and extravagant. Moses says, that "a river went out of Eden to water the garden, and from thence it was parted and became into four heads." This river is supposed to be the common channel of the Euphrates and Tigris, after their confluence; which parted again, below the garden, into two different channels: so that the two channels before, and the other two after their confluence, constitute the heads mentioned by Moses. Which will determine the situation of the garden to have been in the fourth of Mesopotamia, or in Babylonia. The garden was also called *Paradise*; a term of Persic original, denoting a garden. See PARADISE.

EDGINGS, in gardening, the series of small but durable plants, set round the edges or borders of flower-beds, &c. The best and most durable of all plants for this use, is box; which, if well planted, and rightly managed, will continue in strength and beauty for many years. The seasons for planting this, are the autumn, and very early in the spring: and the best species for this purpose is the dwarf Dutch box.

Formerly, it was also a very common practice to plant borders, or edgings, of aromatic herbs; as thyme,

savory, hyssop, lavender, and the like: but these are all apt to grow woody, and to be in part, or wholly, destroyed in hard winters. Daisies, thrift, or sea july-flower, and camomile, are also used by some for this purpose: but they require yearly transplanting, and a great deal of trouble, else they grow out of form; and they are also subject to perish in very hard seasons.

EDHILING, EDHILINGUS, an ancient appellation of the nobility among the Anglo-Saxons.

The Saxon nation, says Nithard (Hist. lib. iv.) is divided into three orders or classes of people; the *edhilingi*, the *frilingi*, and the *lazzi*; which signify the nobility, the freemen, and the vassals or slaves.

Instead of *edhiling*, we sometimes meet with *atheling*, or *atheling*; which appellation was likewise given to the king's son, and the presumptive heir of the crown. See ATHELING.

EDICT, in matters of polity, an order or instrument, signed and sealed by a prince, to serve as a law to his subjects. We find frequent mention of the edicts of the prætor, the ordinances of that officer in the Roman law. In the French law, the edicts are of several kinds: some importing a new law or regulation; others, the erection of new offices; establishments of duties, rents, &c.; and sometimes articles of pacification. In France, edicts are much the same as a proclamation is with us: but with this difference, that the former have the authority of a law in themselves, from the power which issues them forth; whereas the latter are only declarations of a law, to which they refer, and have no power in themselves.

EDILE, or *ÆDILE*. See *ÆDILE*.

EDINBURGH, a city of Mid-Lothian in Scotland, situated in W. Long. 3°, and N. Lat. 56°, near the southern bank of the river Forth.—The origin of the name, like that of most other cities, is very uncertain. Some imagine it to be derived from Eth, a supposed king of the Picts; others from Edwin, a Saxon prince of Northumberland, who over-ran the whole or greatest part of the territories of the Picts about the year 617; while others choose to derive it from two Gaelic words *Dun Edin*, signifying the face of a hill. The name *Edinburgh* itself, however, seems to have been unknown in the time of the Romans. The most ancient title by which we find this city distinguished is that of *Castell Mynyd Agned*; which, in the British language, signifies "the fortress of the hill of St Agnes." Afterwards it was named *Castrum Puellarum*, because the Pictish princesses were educated in the castle (a necessary protection in those barbarous ages) till they were married.—The ages in which these names were given cannot indeed now be exactly ascertained: but the town certainly cannot boast of very great antiquity; since, as Mr Whitaker informs us, the celebrated King Arthur fought a battle on the spot where it is situated towards the end of the fifth century.

The Romans, during the time they held the dominion of part of this island, divided their possessions into six provinces. The most northerly of these was called *Valentia*, which comprehended all the space between the walls of ADRIAN and SEVERUS. Thus, Edinburgh, lying on the very out-skirts of that province which was most exposed to the ravages of the barbarians, became

Edhiling
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Edinburgh.

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the name.

2
Time of its foundation uncertain.

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^{Edinbur.} perpetually subject to wars and devastations; by means of which, the time of its first foundation cannot now be guessed at.

The castle is certainly very ancient. It continued in the hands of the Saxons or English from the invasion of Otha and Ebuza in the year 452 till the defeat of Egfrid king of Northumberland in 685 by the Picts, who then repossessed themselves of it. The Saxon kings of Northumberland reconquered it in the ninth century; and it was retained by their successors till the year 956, when it was given up to Indulphus king of Scotland. In 1093 it was unsuccessfully besieged by the usurper Donald Bane. Whether the city was at that time founded or not is uncertain. Most probably it was: for as protection from violence was necessary in those barbarous ages, the castle of Edinburgh could not fail of being an inducement to many people to settle in its neighbourhood; and thus the city would gradually be founded and increase.—In 1128, King David I. founded the Abbey of Holyroodhouse, for certain canons regular; and granted them a charter, in which he styled the town *Burgo meo de Edwinesburg*, “my borough of Edinburgh.” By the same charter he granted these canons 40 shillings yearly out of the town revenues; and likewise 48 shillings more, from the same, in case of the failure of certain duties payable from the king’s revenue; and likewise one half of the tallow, lard, and hides, of all the beasts killed in Edinburgh.

³ ^{Castle f.r.} In 1174, the castle of Edinburgh was surrendered to Henry II. of England, in order to purchase the liberty of King William I. who had been defeated and taken prisoner by the English. But when William recovered his liberty, he entered into an alliance with Henry, and married his cousin Ermengarde; upon which the castle was restored as part of the queen’s dower.

In 1215, this city was first distinguished by having a parliament and provincial synod held in it.—In 1296, the castle was besieged and taken by Edward I. of England; but was recovered in 1313 by Randolph Earl of Moray, who was afterwards regent of Scotland during the minority of King David II. At last King Robert destroyed this fortress, as well as all others in Scotland, lest they should afford shelter to the English in any of their after incursions into Scotland.—It lay in ruins for a considerable number of years; but was afterwards rebuilt by Edward III. of England, who placed a strong garrison in it.

In 1341 it was reduced by the following stratagem. A man, pretending to be an English merchant, came to the governor, and told him that he had on board his ship in the Forth some wine, beer, biscuits, &c. which he would sell him on very reasonable terms. A bargain being made, he promised to deliver the goods next morning at a very reasonable rate: but at the time appointed, twelve men, disguised in the habit of sailors, entered the castle with the goods and supposed merchant; and having instantly killed the porter and centinels, Sir William Douglas, on a preconcerted signal, rushed in with a band of armed men, and quickly made himself master of the place, after having cut most of the garrison in pieces.

⁴ ^{Cruel execution of the murderers of James I.} The year 1437 is remarkable for the execution of the Earl of Arthol and his accomplices, who had a concern in the murder of James I. The crime, it must

be owned, was execrable; but the punishment was altogether shocking to humanity. For three days successively the assassins were tortured by putting on their heads iron crowns heated red hot, dislocating their joints, pinching their flesh with red hot pincers, and carrying them in that dreadful situation through the streets upon hurdles. At last an end was put to their sufferings, by cutting them up alive, and sending the parts of their mangled bodies to the principal towns of the kingdom.

About the end of the 14th century it was customary to consider Edinburgh as the capital of the kingdom. The town of Leith, with its harbour and mills, had been bestowed upon it by Robert I. in 1329; and his grandson John Earl of Carrick, who afterwards ascended the throne by the name of Robert III. conferred upon all the burghesses the singular privilege of building houses in the castle, upon the sole condition that they should be persons of good fame; which we must undoubtedly consider as a proof that the number of these burghesses was at that time very small. In 1461 a very considerable privilege was conferred on the city by Henry VI. of England when in a state of exile; viz. that its inhabitants should have liberty to trade to all the English ports on the same terms with the city of London. This extraordinary privilege was bestowed in consequence of the kindness with which that king was treated in a visit to the Scottish monarch at Edinburgh; but as Henry was never restored, his gratitude was not attended with any benefit to this city. From this time, however, its privileges continued to be increased from various causes. In 1482 the citizens had an opportunity of liberating King James from the oppression of his nobles, by whom he had been imprisoned in the castle. On this account the provost was by that monarch made hereditary high sheriff within the city, an office which he continues still to enjoy. The council at the same time were invested with the power of making laws and statutes for the government of the city; and the trades, as a testimony of the royal gratitude for their loyalty, received the banner known by the name of the *Blue Blanket*; an ensign formerly capable of producing great commotions, but which has not now been displayed for many years past. However, it still exists; and the convener of the trades has the charge of keeping it.

⁶ It was not long after the discovery of America that the venereal disease, imported from that country, made its way to Edinburgh. As early as 1497, only five years after the voyage of Columbus, we find it looked upon as a most dreadful plague; and the unhappy persons affected with it were separated as effectually as possible from society. The place of their exile was Inchkeith, a small island near the middle of the Forth; which, small as it is, has a spring of fresh water, and now affords pasture to some sheep.

⁷ By the overthrow of James IV. at the battle of Flodden, the city of Edinburgh was overwhelmed with grief and confusion, that monarch having been attended in his unfortunate expedition by the Earl of Angus, then provost, with the rest of the magistrates, and a number of the principal inhabitants, most of whom perished in the battle. After this disaster, the inhabitants being alarmed for the safety of their city,

Edinburgh. it was enacted that every fourth man should keep watch at night; the fortifications of the town were renewed, the wall being also extended in such a manner as to inclose the Grassmarket, and the field on which Heriot's Hospital, the Grey Friars Church, and Charity Workhouse, stand. On the east side it was made to inclose the College, Infirmary, and High School; after which, turning to the north, it met the old wall at the Netherbow-port. After this alarm was over, the inhabitants were gradually relieved from the trouble of watching at night, and a certain number of militia appointed to prevent disturbances; who continue to this day, and are known by the name of the *Town Guard*. Before these new inclosures, most of the principal people lived in the Cowgate without the wall; and the buying-place was situated where the Parliament Close now is. In our days of peace, when no alarm of an enemy is at all probable, great part of the walls, with all the gates, have been taken down, and the city laid quite open, in order to afford more ready passage to the great concourse of people with whom the street is daily filled. But at the period we speak of, not only were the inhabitants much less numerous by reason of the small extent of the city, but it was depopulated by a dreadful plague; so that, to stop if possible the progress of the infection, all houses and shops were shut up for 14 days, and some where infected persons had died were pulled down altogether.

8
Erection of
wooden
houses.

In 1504, the tract of ground called the *Burrough Muir* was totally overgrown with wood, though now it affords not the smallest vestige of having been in such a state. So great was the quantity at that time, however, that it was enacted by the town-council, that whoever inclined to purchase as much wood as was sufficient to make a new front for their house, might extend it seven feet into the street. Thus the city was in a short time filled with houses of wood instead of stone; by which, besides the inconvenience of having the street narrowed 14 feet, and the beauty of the whole entirely marred, it became much more liable to accidents by fire: but almost all these are now pulled down; and in doing this a singular taste in the masonry which supported them is said to have been discovered.

9
Edinburgh
destroyed
by the Eng-
lish.

In 1542, a war with England having commenced through the treachery of Cardinal Beaton, an English fleet of 200 sail entered the Forth; and having landed their forces, quickly made themselves masters of the towns of Leith and Edinburgh. They next attacked the castle, but were repulsed from it with loss; and by this they were so enraged, that they not only destroyed the towns of Edinburgh and Leith, but laid waste the country for a great way round.—These towns, however, speedily recovered from their ruinous state; and in 1547, Leith was again burned by the English after the battle of Pinkie, but Edinburgh was spared.

Several disturbances happened in this capital at the time of the Reformation, of which an account is given under the article SCOTLAND; but none of these greatly affected the city till the year 1570, at which time there was a civil war on account of Q. Mary's forced resignation. The regent, who was one of the contending parties, bought the castle from the perfidious governor (Balfour) for 5000*l*. and the priory of Pittenweem. He did not, however, long enjoy the fruits of this in-

famous bargain. Sir William Kirkcaldy, the new go-Edinburgh-
vornor, a man of great integrity and bravery, declared for the Queen. The city in the mean time was sometimes in the hands of one party and sometimes of another; during which contentions, the inhabitants, as may easily be imagined, suffered extremely. In the year 1570 above mentioned, Queen Elizabeth sent a body of 1000 foot and 300 horse, under the command of Sir William Drury, to assist the king's party. The castle was summoned to surrender; and several skirmishes happened during the space of two years, in which a kind of predatory war was carried on. At last a truce was agreed on till the month of January 1573; and this opportunity the Earl of Morton, now regent, made use of to build two bulwarks across the high-street, nearly opposite to the tolbooth, to defend the city from the fire of the castle.

On the first of January, early in the morning, the governor began to cannonade the city. Some of the cannon were pointed against the fish-market, then held on the high street; and the bullets falling among the fishes, scattered them about in a surprising manner, and even drove them up so high in the air, that they fell down upon the tops of the houses. This unusual spectacle having brought a number of people out of their houses, some of them were killed and others dangerously wounded. Some little time afterwards, several houses were set on fire by shot from the castle, and burned to the ground; which greatly enraged the people against the governor.—A treaty was at last concluded between the leaders of the opposite factions; but Kirkcaldy refused to be comprehended in it. The regent therefore solicited the assistance of Queen Elizabeth, and Sir William Drury was again sent into Scotland with 1500 foot and a train of artillery. The castle was now besieged in form, and batteries raised against it in different places. The governor defended himself with great bravery for 33 days; but finding most of the fortifications demolished, the well choked up with rubbish, and all supplies of water cut off, he was obliged to surrender. The English general, in the name of his mistress, promised him honourable treatment; but the Queen of England shamefully gave him up to the regent, by whom he was hanged.

Soon after this, the spirit of fanaticism, which somehow or other succeeded the Reformation, produced violent commotions, not only in Edinburgh, but thro' the whole kingdom. The foundation of these disturbances, and indeed of most others which have ever happened in Christendom on account of religion, was that pernicious maxim of Popery, that the church is independent of the state. It is not to be supposed that this maxim was at all agreeable to the sovereign; but such was the attachment of the people to the doctrines of the clergy, that King James found himself obliged to compound matters with them. This, however, answered the purpose but very indifferently; and at last a violent uproar was excited. The King was then sitting in the Court of Session, which was held in the Tolbooth, when a petition was presented to him by six persons, lamenting the dangers which threatened religion; and being treated with very little respect by one Bruce a minister, his Majesty asked who they were that dared to convene against his proclamation? He was answered

TO
the Siege of the
castle in
Queen Eli-
zabeth's
time.

IF
The city
incurs the
displeasure
of James VI.

Edinburgh. ed by Lord Lindsay, that they dared to do more, and would not suffer religion to be overthrown. On this the King perceiving a number of people crowding into the room, withdrew into another without making any reply, ordering the door to be shut. By this the petitioners were so much enraged, that on their return to the church the most furious resolutions were taken; and had it not been for the activity of Sir Alexander Home the provost, and Mr Watt the deacon-convenor who assembled the crafts in his Majesty's behalf, it is more than probable that the door would have been forced, and an end put to his life. This affront was so much reſented by the King, that he thought proper to declare Edinburgh an unfit place of residence for the court or the administration of justice. In consequence of this declaration, he commanded the college of justice, the inferior judges, and the nobility and barons, to retire from Edinburgh, and not to return without express licence. This unexpected declaration threw the whole town into consternation, and brought back the magistrates and principal inhabitants to a sense of their duty. With the clergy it was far otherwise. They railed against the King in the most furious manner; and endeavouring to persuade the people to take up arms, the magistrates were ordered to imprison them: but they escaped by a timely flight. A deputation of the most respectable burghes was then sent to the King at Linlithgow, with a view to mitigate his resentment. But he refused to be pacified; and on the last day of December 1596 entered the town between two rows of his soldiers who lined the streets, while the citizens were commanded to keep within their houses. A convention of the estates was held in the Tolbooth, before whom the magistrates made the most abject submissions, but all in vain. The convention declared one of the late tumults, in which an attack had been made upon the King's person, to be high treason; and ordained, that if the magistrates did not find out the authors, the city itself should be subjected to all the penalties due to that crime. It was even proposed to raze the town to the foundation, and erect a pillar on the spot where it had stood, as a monument of its crimes. The inhabitants were now reduced to the utmost despair; but Queen Elizabeth interposing in behalf of the city, the King thought proper to abate somewhat of his rigour. A criminal prosecution, however, was commenced, and the town-council were commanded to appear at Perth by the first of February. On their petition, the time for their appearance was prolonged to the first of March; and the attendance of 13 of the common-council was declared sufficient, provided they had a proper commission from the reith. The trial commenced on the fifth day of the month; and one of the number having failed in his attendance, the cause was immediately decided against the council: they were declared rebels, and their revenues forfeited.

12
Is again received into
favour.

For 15 days the city continued in the utmost confusion; but at last, on their earnest supplication, and offering to submit entirely to the King's mercy, the community were restored on the following conditions, which they had formerly proffered: That they should continue to make a most diligent search for the authors of the tumult, in order to bring them to condign punishment; that none of the seditious ministers should be

allowed to return to their charges, and no others admitted without his Majesty's consent; and that in the election of their magistrates they should present a list of the candidates to the King and his lords of council and session, whom his Majesty and their lordships might approve or reject at pleasure. To these conditions the King now added some others; viz. that the houses which had been possessed by the ministers should be delivered up to the King; and that the clergymen should afterwards live dispersed through the town, every one in his own parish: That the town-council house should be appointed for accommodating the court of exchequer; and that the town should become bound for the safety of the lords of session from any attempts of the burghes, under a penalty of 40,000 merks; and, lastly, that the town should immediately pay 20,000 merks to his Majesty.

Upon these terms a reconciliation took place; which appears to have been very complete, as the King not only allowed the degraded ministers to be replaced, but in 1610 conferred a mark of his favour on the town, by allowing the provost to have a sword of state carried before him, and the magistrates to wear gowns on public occasions. In 1618 he paid his last visit to this city, when he was received with the most extravagant pomp and magnificence. See SCOTLAND.

The events which during this period, regard the internal police of the city, were principally the following. After the unfortunate battle at Pinkie, the magistrates, probably apprehending that now their power was enlarged by reason of the common calamity, proceeded in some respects in a very arbitrary manner; forcing the inhabitants to furnish materials for the public works; enjoining merchants to bring home silver to be coined at the mint; and ordering lanterns to be hung out at proper places to burn till nine at night, &c. Another invasion from England being apprehended in 1558, the city raised 1450 men for its defence, among whom there are said to have been 200 tailors, so that their profession seems to have been in a very flourishing state at that time. During the disturbances which happened at the reformation, and of which a particular account is given under the article SCOTLAND, it was enacted, that the figure of St Giles should be cut out of the town standard, and that of a thistle inserted in its place. It was likewise enacted, that none but those who professed the reformed religion should serve in any office whatever; and the better to preserve that extraordinary appearance of sanctity which was affected, a pillar was erected in the North Loeh, for the purpose of ducking fornicators.

In 1595, the boys of the High School rose against their masters; and such was the barbarism of those days, that one of these striplings shot a magistrate with a pistol, who had come along with the rest to reduce them to obedience. The reason of the uproar was, that they were in that year refused two vacations, which had been customary in former times: however, they were at last obliged to submit, and ever since have been allowed only one for about six weeks in the autumn. The same year the house of one of the bailies was assaulted by the tradesmen's sons, assisted by journeymen who had not received the freedom of the town: he escaped with his life, but the offenders were banished the city for ever.

Edinburgh.

13

Proceedings of the
magistrates, &c.

Edinburgh.

14
Disturbances in the time of Charles I.

In the beginning of the reign of Charles I. a perfect harmony seems to have subsisted between the court and the city of Edinburgh; for in 1627 king Charles I. presented the city with a new sword and gown to be worn by the provost at the times appointed by his father James VI. Next year he paid a visit to this capital, and was received by the magistrates in a most pompous manner; but soon after this the disturbances arose which were not terminated but by the death of that unfortunate monarch. These commenced on an attempt of Charles to introduce Episcopacy into the kingdom; and the first step towards this was the erection of the three Lothians and part of Berwick into a diocese, Edinburgh being the episcopal seat, and the church of St Giles the cathedral. An account of the disturbance occasioned by the first attempt to read the prayer-book there, is given under the article BRITAIN; but though the attempt was given over, the minds of the people were not to be quieted. Next winter they resorted to town in such multitudes, that the privy-council thought proper to publish two acts; by one of which the people were commanded, under severe penalties, to leave the town in 24 hours; and by the other, the court of session was removed to Linlithgow. The populace and their leaders were so much enraged by the latter, that lord Traquair and some of the bishops narrowly escaped with their lives; and next year (1638) matters became still more serious. For now, the king having provoked his subjects throughout all Scotland with the innovations he attempted in religion, Edinburgh was made the general place of rendezvous, and the most formidable associations took place; an account of which has already been given under the article BRITAIN. Each of the towns in Scotland had a copy; and that which belonged to Edinburgh, crowded with 5000 names, is still preserved among the records of the city. Notwithstanding this disagreement, however, the king once more visited Edinburgh in 1641, and was entertained by the magistrates at an expence of 12,000*l.* Scots. It does not appear that after this the city was in any way particularly concerned with the disturbances which followed either throughout the remainder of the reign of Charles I. the commonwealth, or the reign of Charles II. In 1680 the duke of York with his duchess, the princess Anne, and the whole court of Scotland, were entertained by the city in the Parliament House, at the expence of 15,000*l.* Scots. At this time it is said that the scheme of building the bridge over the North Loch was first projected by the duke.

15
Regulations made by the magistrates.

From the time that king James VI. paid his last visit to Edinburgh in 1618, till the time of the union in 1707, a considerable number of private regulations were made by the magistrates; some of them evidently calculated for the good of the city, others strongly characteristic of that violent spirit of fanaticism which prevailed so much in the last century. Among the former was an act passed in 1621, that the houses, instead of being covered with straw or boards, should have their roofs constructed of slate, tiles, or lead. This act was renewed in 1667; and in 1698 an act was passed regulating their height also. By this they were restrained to five stories, and the thickness of the wall determined to be three feet at bottom. In 1684 a lantern with a candle was ordered to be hung out in the first floor of

every house in order to light the streets at night; and there were two coaches with four horses each ordered to be bought for the use of the magistrates; but it does not appear how long they continued to be used. In 1681 the court of session discontinued its sittings in summer: but as this was found to be attended with inconvenience, an act was passed for their reformation, which has continued ever since. During the time of the civil war in 1649, the city was visited by the plague, which is the last time that dreadful distemper hath made its appearance in this country. The infection was so violent, that the city was almost depopulated, the prisoners were discharged from the tolbooth, and an act was made for giving one Dr Joannes Politius a salary of 80*l.* Scots per month, for visiting those who were infected with the disease. In 1677 the first coffee-houses were allowed to be opened, but none without a licence: and the same year the town-council regulated the price of penny-weddings; ordaining the men to pay no more than two shillings, and the women 18 pence; very extravagant prices having been exacted before.

In contradistinction to these salutary acts, we may state those which show an extravagant desire of preserving the appearance of virtue in the female sex, as if it had been possible for others to inspire them with virtuous notions if they had not imbibed them of themselves. In 1633 an act of council was passed, by which women were forbidden to wear plaids over their faces, under penalty of five pounds and the forfeiture of the plaid for the first fault. Banishment was the punishment of the third. The reason assigned for this act was, that matrons were not known from strumpets and loose women, while the plaid continued to be worn over the face. This act was renewed in 1637 and 1638. Succeeding town-councils continued to show the same regard to these matters; for in 1695 they enacted, that no inn-keeper, vintner, or ale-seller, should for the future employ women as waiters or servants, under the penalty of five shillings sterling for each.

The following anecdote may perhaps make the virtues of these legislators themselves wear a suspicious aspect. In 1649 the city having borrowed *L.* 40,000 Scots, in order to raise their quota of men for his majesty, the payment of it was absolutely refused by the town-council when a demand was made for that purpose. That they might not, however, depend entirely upon their own opinion in a matter of such importance, they took that of the General Assembly upon the subject; and it was determined by these reverend divines, that they were not in conscience bound to pay for an unlawful engagement which their predecessors had entered into. But in 1652, Cromwell's parliament, who pretended to no less sanctity than they, declared themselves of a very different opinion; and on the application of one of the creditors, forced them to repay the sum.

The treatment which the brave marquis of Montrose met with, likewise fixes an indelible stigma both upon the magistrates and clergy at that time. Having been put under sentence of excommunication, no person was allowed to speak to him or do him the least office of friendship. Being met without the city by the magistrates and town-guard, he was by them conducted in a kind of gloomy procession through the streets bare-

16
Infamous treatment of the marquis of Montrose.

Edinburgh. bareheaded, and in an elevated cart made for the purpose; and the other prisoners walking two and two before him. At the time of his execution he was attended by one of the minillers, who, according to his own account, did not choofe to return till *he had feen him catten over the ladder.*

The union in 1707 had almost produced a war between the two kingdoms which it was designed to unite; and on that occasion Edinburgh became a scene of the most violent disturbances, of which a particular account is given under the article BRITAIN. During the time the act was passing, it was found absolutely necessary for the guards and four regiments of foot to do duty in the city. The disturbances were augmented by the disaffection of the two members of parliament; and notwithstanding the victory gained at that time by the court party, Sir Patrick Johnston the provost, who voted for the union, was obliged afterwards to leave the country. In 1715 the city remained faithful to the royal cause, and proper measures were taken for its defence. A committee of safety was appointed, the city-guard increased, and 400 men raised at the expence of the town. The trained bands likewise were ordered out, 100 of whom mounted guard every night: by which precautions the rebels were prevented from attempting the city: they however made themselves masters of the citadel of Leith; but fearing an attack from the duke of Argyle, they abandoned it in the night-time. A scheme was even laid for becoming masters of the castle of Edinburgh; for which purpose they bribed a serjeant to place their scaling ladders. Thus some of the rebels got up to the top of the walls before any alarm was given; but in the mean time the plot being discovered by the serjeant's wife, her husband was hanged over the place where he had attempted to introduce the rebels. The expence of the armament which the city had been at on this occasion amounted to about 1700*l.* which was repaid by government in the year 1721.

The loyalty of this city was still farther remarkable in the year 1725, when disturbances were excited in all parts of the kingdom, particularly in the city of Glasgow, concerning the excise-bill; for all remained quiet in Edinburgh, notwithstanding the violent outcries that were made elsewhere: and so remarkable was the tranquillity in the metropolis, that government afterwards returned thanks to the magistrates for it. In 1736, however, the city had again the misfortune to fall under the royal displeasure, on the following account. Two smugglers having been detected in stealing their own goods out of a custom-house, were condemned to be hanged. The crime was looked upon as trivial; and therefore a general murmur prevailed among the populace, which was no doubt heightened by the following accident. At that time it had been customary for persons condemned to die to be carried each Sunday to the church, called from that circumstance the *Talbooth-church*. The two prisoners just mentioned were conducted in the usual way, guarded by three soldiers, to prevent their making their escape: but having once gone thither a little before the congregation met, one of the prisoners seized one of the guards in each hand, and the other in his teeth, calling out to his companion to run; which he immediately did with such speed, that he soon got out of sight, and

was never heard of afterwards. The person who had thus procured the life of his companion without regard to his own, would no doubt become a general object of compassion; and of course, when led to the place of execution, the guard were severely pelted by the mob, and some of them, according to the testimony of the witnesses who were sworn on the occasion, pretty much wounded. By this Captain Porteous, who commanded the guard, was so much provoked, that he gave orders to fire, by which six people were killed and eleven wounded. The evidence, however, even of the fact that the orders to fire were given, appears not to have been altogether unexceptionable; nevertheless, on this he was tried and condemned to be executed. At that time the king was absent at Hanover, having left the regency in the hands of the queen; and the case of the unfortunate Porteous having been represented to her, she was pleased to grant him a reprieve: but such was the inveteracy of the people against him, that they determined not to allow him to avail himself of the royal clemency. On the day that had been appointed for his execution, therefore, a number of people assembled, shut the gates of the city, and burnt the door of the prison, the same which the mob would formerly have broke open in order to murder king James. They then took out Porteous, whom it was found impossible to rescue out of their hands, though every method that the magistrates could take for that purpose in such a confusion was made use of. It was even proved, that the member of parliament went to the commander in chief, and requested that he would send a party of soldiers to quell the disturbance, but was absolutely denied this request, because he could not produce a written order from the provost to this purport; which, in the confusion then existing in the city, could neither have been expected to be given by the provost, nor would it have been safe for any person to have carried it about him. Thus the unhappy victim was left in the hands of his executioners; and being dragged by them to the place destined for receiving his fate, was hanged on a dyer's sign-post. As they had not brought a rope along with them, they broke open a shop where they knew they were to be had; and having taken out what they wanted, left the money upon the table, and retired without committing any other disorder.

Such an atrocious insult on government could not but be highly resented. A royal proclamation was issued, offering a pardon to any accomplice, and a reward of *£*200 to any person who would discover one of those concerned. The proclamation was ordered to be read from every pulpit in Scotland the first Sunday of every month for a twelvemonth: but so divided were the people in their opinions about this matter, that many of the clergy hesitated exceedingly about complying with the royal order, by which they were brought in danger of being turned out of their livings; while those who complied were rendered so unpopular, that their situation was rendered still worse than the others. All the efforts of government, however, were insufficient to produce any discovery; by which, no doubt, the court were still more exasperated: and it was now determined to execute vengeance on the magistrates and city at large. Alexander Wilson, the provost at that time, was imprisoned three weeks before he

17
Loyalty of
the city in
1715 and
1725.

18
Captain
Porteous
executed by
a mob.

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Edinburgh could be admitted to bail; after which, he and the four bailies, with the lords of judicatory, were ordered to attend the house of peers at London. On their arrival there, a debate ensued, whether the lords should attend in their robes or not? but at last it was agreed, that they should attend in their robes at the bar. This, however, was refused by their lordships, who insisted that they should be examined within the bar; upon which the affair of their examination was dropped altogether. A bill was at last passed both houses, by which it was enacted, that the city of Edinburgh should be fined in 2000*l.* for the benefit of Porteous's widow (though she was prevailed upon to accept of *L.* 1500 for the whole); and the provost was declared incapable of ever serving government again in any capacity whatever. To prevent such catastrophes in time coming, the town-council enacted, that, on the first appearance of an insurrection, the chief officers in the different societies and corporations should repair to the council, to receive the orders of the magistrates for the quelling of the tumult, under the penalty of 8*l.* 6*s.* 8*d.* for each omission.

²⁰
The city
taken by
the rebels
in 1745.

In 1745, the city was invested by the Pretender's army; and on the 17th of September, the Netherbow-gate being opened to let a coach pass, a party of Highlanders, who had reached the gate undiscovered, rushed in, and took possession of the city. The inhabitants were commanded to deliver up their arms at the palace of Holyroodhouse; a certain quantity of military stores was required from the city, under pain of military execution; and an assessment of 2*s.* 6*d.* upon the pound was imposed upon the *real* rents within the city and liberties, for defraying that expence.

The Pretender's army guarded all the avenues to the castle; but no signs of hostility ensued till the 25th of the month, when the garrison being alarmed from some unknown cause, a number of cannon were discharged at the guard placed at the West-port, but with very little effect. This gave occasion to an order to the guard at the weigh-house, to prevent all intercourse between the city and castle; and then the governor acquainted the provost by letter, that unless the communication was preserved, he would be obliged to dislodge the guard by means of artillery. A deputation was next sent to the Pretender; acquainting him with the danger the city was in, and intreating him to withdraw the guard. With this he refused to comply; and the Highland centinels firing at some people who were carrying provisions into the castle, a pretty smart cannonading ensued, which set on fire several houses, killed some people, and did other damage. The Pretender then consented to dismiss the guard, and the cannonading ceased. After the battle of Culloden, the provost of Edinburgh was obliged to stand a very long and severe trial, first at London and then at Edinburgh, for not defending the city against the rebels; which, from the situation and extent of the walls, every one must have seen to be impossible.

During this trial a very uncommon circumstance happened; the jury having sat two days, insisted that they could sit no longer, and prayed for a short respite. As the urgency of the case was apparent, and both parties agreed, the court, after long reasoning, adjourned till the day following, taking the jury bound under a penalty of *L.* 500 each; when the court continued sitting

N^o 108.

two days longer, and the jury were one day inclosed. Edinburgh. The event was, that the provost was exculpated.

After the battle of Culloden the duke of Cumberland caused fourteen of the rebel standards to be burned at the cross: that of the pretender was carried by the common executioner, the others by chimney-sweepers; the heralds proclaiming the name of the commanders to whom they belonged as they were thrown into the fire. At this time the city of Edinburgh felt a temporary inconvenience from the election of their magistrates not having taken place at the usual time; so that it became necessary to apply to his majesty for Government of the city. This city refused. The restoration of the government of the city. This was readily granted, the burghesses being allowed a poll-tax; after which an entire new set of magistrates was returned, all of them friends to the house of Hanover; and soon after the freedom of the city in a gold box was presented to the duke of Cumberland.

With these transactions all interferences betwixt government and the metropolis of Scotland were ended; the rest of its history therefore only consists of internal occurrences, the regulations made by its own magistrates for the benefit of the city, their applications to government for leave to improve it, or the execution of these improvements; of which we shall now give a brief detail.

In the year 1716, the city first bestowed a settled salary be-
lary on the provost, in order to enable him to support flow-
the dignity of first magistrate. This was at first *L.* 300; 22
but has since been augmented to *L.* 500, which his
lordship still enjoys. In 1718 it was recommended to
the magistrates to distinguish themselves by wearing coats
of black velvet, for which they were allowed *L.* 10; 23
but this act being abrogated in 1754, gold chains were
assigned as badges of their office, which they still continue
to wear. Provost Kincaid happened to die in
office in the year 1777; which being a very rare accident,
perhaps the only one of the kind to be met with in the
records of Edinburgh, he was buried with great solemnity,
and a vast concourse of people attended.

Tumults have been frequent in Edinburgh, chiefly on account of
account of the dæmours of provisions. In 1740 Bell's 23
mills were first attacked by the populace, and afterwards
Leith mills: nor could the rioters be dispersed till the military
had fired among them, and wounded three, of whom
one died; and it was found necessary to order some dra-
goons into the city in order to preserve tranquillity. In
1742 another violent tumult took place, owing to a cus-
tom of stealing dead bodies from their graves for anatomical
purposes, which had then become common. The populace
beat to arms, threatened destruction to the surgeons;
and in spite of all the efforts of the magistrates demolished
the house of the beadle at St. Cuthbert's. In 1756, new
disturbances, which required the assistance of the military,
took place: the cause at this time was the impressing of
men for the war which was then commencing. A
disturbance was likewise excited in 1760. This was
occasioned by the footmen, who till then were allowed
to follow their masters into the playhouse, and now took
upon them to disturb the entertainment of the company;
the consequence of which was, that they were turned out,
and have ever since been obliged to wait for their masters.
In 1763 and 1765, the tumults on account of the price of
provisions were renewed; many of the meal-mongers had
their

Edinburgh. their houses broken open and their shops destroyed.

The magistrates, as usual, were obliged to call in a party of dragoons to quell the disturbance; but at the same time, to put an effectual stop, as far as was in their power, to these proceedings for the future, they gave security, that people who brought grain or provision into the market should be secured in their property. Since that time there have been no tumults directly on the account of provisions; though in 1784 a terrible riot and attack of a distillery at Canonmills took place, on a supposition that the distillers enhanced the price of meal by using unmaltd grain. The attack was repelled by the servants of the distillery; but the mob could not be quelled until the sheriff called the soldiers quartered in the castle to his assistance. The same night a party of rioters set out for Ford, a place ten miles to the southward, where there was likewise a large distillery; which, as there was none to make any opposition, they soon destroyed. One man was killed in this riot at Edinburgh by the fire of a servant of the distillery, and several of the rioters were afterwards secured and punished.

In the years 1778 and 1779 two very alarming disturbances happened, which threatened a great deal of bloodshed, though happily they were terminated without any. The first was a mutiny of the earl of Seaford's Highland regiment, who were at this time quartered in the castle. These having been ordered to embark, for some reason or other unanimously refused, and posted themselves on the top of Arthur's seat, where they continued for two days. Troops were collected to prevent their escape, and the inhabitants were ordered to keep within doors at the first toll of the great bell, which was to be a signal of violence about to take place; but fortunately all the fears, naturally arising from the expectation of this event, were dissipated by an accommodation. The other happened on account of the attempt to repeal the penal laws against the Papists; and was much more alarming than the other, as being the effect of a premeditated scheme and determined resolution to oppose government. On the 2d of February 1779 a mob assembled in the evening, burned a Popish chapel, and plundered another. Next day they renewed their depredations; destroying and carrying off the books, furniture, &c. of several Popish priests and others of that persuasion. The riot continued all that day, though the assistance of the military was called in; but happily no lives were lost, nor was there any firing. The city was afterwards obliged to make good the damage sustained by the Catholics on this occasion, which was estimated at L. 1500. This year also an unlucky accident happened at Leith. About 50 Highland recruits having refused to embark, a party of the South Fencibles was sent to take them prisoners. Unexpectedly, however, the Highlanders stood upon their defence; when, after some words, a firing commenced on both sides, and about one half of the Highlanders were killed and wounded, the remainder being taken prisoners and carried to the castle. Captain Mansfield and two or three privates were killed in this affray.

We shall close this history of Edinburgh with a general account of the improvements which have lately taken place in it, and of which a particular description

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will afterwards be given. These began in the year Edinburgh. 1753, when the foundation-stone of the Exchange was laid, at which time there was a grand procession, and the greatest concourse of people ever known in Edinburgh. A triumphal arch was erected for the purpose, through which the procession passed, and medals were scattered among the populace. In 1756 the high street was cleared by the removal of the crosses; though many regretted this, on account of its being a very ancient and elegant building. In the middle it had an unicorn placed on the top of a pillar 20 feet high; but this fine ornament was broken to pieces by the giving way of the tackle by which it was attempted to remove it. It is now again erected at Drum, a seat belonging to lord Somerville, about four miles from Edinburgh. In 1763 the first stone of the north bridge was laid by provost Drummond; and in 1767 an act of parliament was obtained for extending the royalty of the city over the fields to the northward, where the New Town is now situated. About the same time a spot of ground upon the south side of the town was purchased by a private person for L. 1200, which being leased out for building, gave rise to the increase of the town on that quarter; and this proceeded the more rapidly, as the houses built there were free from the dues imposed upon others subject to the royalty. In 1774 the foundation of the Register-Office was laid. In 1784 the project for rendering the access to the town equally easy on both sides was begun to be put in execution by laying the foundation of the south bridge. At the same time a great improvement was made by reducing the height of the street several feet all the way from the place where the cross stood to the Netherbow; by which means the ascent is rendered more easy, not only for carriages, but also for persons who walk on foot. At the same time, the street was farther cleared by the removal of the town guard-house, which had long been complained of as an encumbrance. It is still farther in contemplation to remove the Luckenbooths: and when this is accomplished, with other improvements by which it must necessarily be accompanied, it is to be questioned whether any city in Britain will be able to vie with Edinburgh in elegance and beauty.

Having thus given a concise history of the city from its earliest foundation, we shall now proceed to describe it in its most improved state.

Edinburgh is situated upon a steep hill, rising from Description east to west, and terminating in a high and inaccessible of Edinburgh. rock, upon which the castle stands. At the east end or lower extremity of this hill stands the abbey of Holyrood-house, or king's palace, distant from the castle upwards of a mile; and betwixt which, along the top of the ridge, and almost in a straight line, runs the high-street. On each side, and parallel to this ridge or hill, is another ridge of ground lower than that in the middle, and which does not extend so far to the east; that on the south being intercepted by Salisbury-rocks and Arthur's-seat, a hill of about 800 feet of perpendicular height; and that on the north by the Calton-hill, considerably lower than Arthur's-seat: so that the situation of this city is most singular and romantic; the east or lower part of the town lying between two hills; and the west or higher part rising up

Qq towards

Edinburgh towards a third hill, little inferior in height to the highest of the other two, upon which, as has been observed, the castle is built, and overlooks the town.

The buildings of the town terminate at the distance of about 200 yards from the castle-gate; which space affords a most delightful as well as convenient and beautiful walk to the inhabitants. The prospect from this spot is perhaps the finest any where to be met with, for extent, beauty, and variety.

In the valley or hollow betwixt the mid and the south ridges, and nearly parallel to the high-street, is another street called the Cowgate; and the town has now extended itself over most part of that south ridge also. Betwixt the mid and the north ridges was a loch, which, till of very late, terminated the town on that side. From the high-street towards the loch on the north, and Cowgate on the south, run narrow cross streets or lanes, called *wynds* and *closets*, which grow steeper and steeper the farther west or nearer the castle; so that, were it not for the closeness and great height of the buildings, this city, from its situation and plan, might naturally be expected to be the best aired, as well as the cleanest, in Europe. The former, notwithstanding these disadvantages, it enjoys in an eminent degree; but we cannot compliment it upon the latter, notwithstanding every possible means has been used by the magistrates for that purpose.

The steepness of the ascent makes the access to the high-street from the north and south very difficult; which no doubt greatly retarded the enlargement of the city. To remedy this inconvenience on the north, and with a view to extend the town on that quarter, a most elegant bridge has been thrown over the north loch, which joins the north ridge to the middle of the high-street, by so easy an ascent as one in sixteen; and in pursuance of the design, a plan of a new town to the north was fixed upon, and is now nearly finished, with an elegance and taste that does honour to this country. In like manner, to facilitate the access from the south side, a bridge has been thrown over the valley through which the Cowgate runs; which, if not equally elegant with the north bridge, is certainly as convenient.

26
Account of the gradual increase of Edinburgh

The gradual increase of the city of Edinburgh may in some degree be understood from the traces of its ancient walls that still remain. James II. in 1450, first bestowed on the community the privilege of fortifying the city with a wall, and empowered them to levy a tax upon the inhabitants for defraying the expence. When the city was first fortified, the wall reached no further than the present water-house, or reservoir, on the castle-hill: from thence to the foot of Halkerston's wynd, just below the new-bridge, the city was defended by the north-loch; an inconsiderable morass, which, being formerly overflowed, formed a small lake that hath since been drained. From this place to the foot of Leith-wynd, it does not appear how the city was fortified: but from the foot of Leith-wynd to the Nether bow-port it was defended only by a range of houses; and when these had become ruinous, a wall was built in their place. The original wall of Edinburgh, therefore, began at the foot of the north-east rock of the castle. Here it was strengthened by a small fortress, the ruins of which are still to be seen, and are called the *well-house tower*, from their having a spring in their

Edinburgh neighbourhood. When the wall came opposite to the reservoir, it was carried quite across the hill, having a gate on the top for making a communication between the town and castle. In going down the hill, it went slanting in an oblique direction to the first angle in going down the West-bow, where was a gate named the *Upper-bow port*, one of the hooks of which still remains. Thence it proceeded eastward in such a manner, as would have cut off not only all the Cowgate, but some part of the parliament-house; and being continued as far as the mint-close, it turned to the north-east, and connected itself with the buildings on the north side of the high-street, where was the original *Nether-bow Port*, about 50 yards west from that which afterwards went by the same name.

Soon after the building of this wall, a new street was formed on the outside of it, named the *Cowgate*, which in the 16th century became the residence of the nobility, the senators of the college of justice, and other persons of the first distinction. After the fatal battle of Flodden, however, the inhabitants of the Cowgate became very anxious to have themselves defended by a wall as well as the rest. The wall of the city was therefore extended to its present limits. This new wall begins on the south-east side of the rock on which the castle is built, and to which the town-wall comes quite close. From thence it descends obliquely to the West-port; then ascends part of a hill on the other side, called the *High Riggs*; after which, it runs eastward with but little alteration in its course, to the Britto and Potter-row ports, and from thence to the Pleasance. Here it takes a northerly direction, which it keeps from thence to the Cowgate-port; after which the inclosure is completed to the Netherbow by the houses of St Mary's wynd. The original Netherbow port being found not well adapted for defence was pulled down, and a new one built in 1571 by the adherents of queen Mary. In 1606, the late handsome building was erected about 50 yards below the place where the former stood. It was two stories high, and had an elegant spire in the middle; but being thought to encumber the street, and the whole building being in a crazy situation, it was pulled down by order of the magistrats in 1764.

In the original wall of Edinburgh there was, as has been already observed, a port on the castle-hill. On the extension of the wall, after building the houses in the Cowgate, this gate was pulled down. That in the upper or west bow flood for a much longer time, and was pulled down within the memory of some persons lately or perhaps still living. Besides these, there was a third, about 50 yards above the head of the Canon-gate; but whether there were any more, is uncertain. The ports or gates of the new walls were, 1. The *West-port*, situated at the extremity of the Grass-market; beyond which lies a suburb of the town and a borough of regality, called *Portsburgh*. Next to this is a wicket, struck out of the town-wall in 1744, for the purpose of making an easier communication between the town and the public walks in the meadows, than by Britto-port. The next to this was *Britto-port*, built in 1515; beyond which lies a suburb called *Britto-street*. At a small distance from Britto was the *Potter-row Port*, which took this name from a manufactory of earthen ware in the neighbourhood. Formerly it was called *Kirk of Field*

Edinburgh. Field Port. Between this and the Cowgate-port flood, another, called *St Mary's Wynd Port*, which extended from east to west across the foot of the Pleasance, and which was demolished only since the middle of the last century.—Close to the middle of this flood the *Cowgate-port*; which opened a communication between the Cowgate and St Mary's wynd, and the Pleasance.—The *Nether-bow Port* has been already spoken of.—At the foot of Leith-wynd was another gate, known by the name of *Leith-wynd Port*; and within it was a wicket giving access to the church of Trinity College, and which still remains. At the foot of Halkerston's wynd was another, which, as well as the former, was built about the year 1560. Both of these were pulled down some years ago, and all the rest in 1785.—Another still remains at the foot of the Canongate, known by the name of the *Water-gate*.

For 250 years the city of Edinburgh occupied the same space of ground, and it is but very lately that its limits have been so considerably enlarged. In the middle of the 16th century, it is described as extending in length about an Italian mile, and about half as much in breadth; which answers very nearly to its present limits, the late enlargements only excepted.—This space of ground, however, was not at that time occupied in the manner it is at present. The houses were neither so high nor so crowded upon each other as they are now. This was a consequence of the number of inhabitants increasing, which has occasioned the raising of the houses to such an height as is perhaps not to be paralleled in any other part of the world. Till the time of the Reformation, the burying ground of the city extended over all the space occupied by the Parliament-square, and from thence to the Cowgate. The lands lying to the southward of the Cowgate were chiefly laid out in gardens belonging to the convent of Black-friars, and the church of St Mary in the Field. These extended almost from the Pleasance to the Potterrow-port. From the Bristo to the West-Port, the ground was laid out in gardens belonging to the Gray-friars. The magistrates, on their application to queen Mary, obtained a grant of the Gray-friars gardens for a burying-place; for which it was given as a reason, that they were somewhat distant from the town. Here, however, it must be understood, that these gardens were distant from the houses, and not without the walls; for they had been inclosed by them long before.—In the time of James I. the houses within the walls seem to have been in general, if not universally, covered with thatch or broom; and not above 20 feet high. Even in the year 1621, these roofs were so common, that they were prohibited by act of parliament, in order to prevent accident from fire.—In the middle of the last century, there were neither courts nor squares in Edinburgh. The Parliament close or square is the oldest of this kind in the city. Miln's square, James's court, &c. were built long after; and Argyle's and Brown's squares within these 50 years.

The *New Town* was projected in the year 1752; but as the magistrates could not then procure an extension of the royalty, the execution of the design was suspended for some time. In 1767, an act was obtained, by which the royalty was extended over the

fields to the northward of the city; upon which advertisements were published by the magistrates, desiring proper plans to be given in. Plans were given in accordingly, and that designed by Mr James Craig architect was adopted. Immediately afterwards, people were invited to purchase lots from the town-council; and such as purchased became bound to conform to the rules of the plan. In the mean time, however, the town-council had secretly referred to themselves a privilege of departing from their own plan; which they afterwards made use of in such a manner as produced a law-suit. According to the plan held forth to the purchasers, a canal was to be made through that place where the north-loch had been, and the bank on the north side of it laid out in terraces: but instead of this, by an act of council, liberty was reserved to the town to build upon this spot; and therefore, when many gentlemen had built genteel houses in the new town on faith of the plan, they were surprised to find the spot appointed for terraces and a canal, beginning to be covered with mean irregular buildings, and work-houses for tradesmen. This deviation was immediately complained of; but as the magistrates showed no inclination to grant any redress, a prosecution was commenced against them before the Lords of Session. In that court the cause was given against the pursuers, who thereupon appealed to the House of Lords. Here the sentence of the Court of Session was reversed, and the cause remitted to the consideration of their Lordships. At last, after an expensive contest, matters were accommodated. The principal term of accommodation was, that some part of the ground was to be laid out in terraces and a canal; but the time of disposing of it in that manner, was referred to the Lord President of the Court of Session and the Lord Chief Baron of the Exchequer.—The fall of part of the bridge, hereafter mentioned, proved a very considerable disadvantage to the new town; as it necessarily induced a suspicion that the passage, by means of the bridge, could never be rendered safe. An oversight of the magistrates proved of more essential detriment. A piece of ground lay to the southward of the old town, in a situation very proper for building. This the magistrates had an opportunity of purchasing for 1200*l*; which, however, they neglected, and it was bought by a private person, who immediately feued it out in lots for building, as has been already mentioned. The magistrates then began to see the consequence, namely, that this spot being free from the duties to which the royalty of Edinburgh is subject, people would choose to reside there rather than in the New Town. Upon this they offered the purchaser 2000*l*. for the ground for which he had paid 1200*l*.; but as he demanded 20,000*l*. the bargain did not take place. Notwithstanding these discouragements, the New Town is now almost finished; and from the advantages of its situation, and its being built according to a regular plan, it hath undoubtedly a superiority over any city in Britain. By its situation, however, it is remarkably exposed to storms of wind, which, at Edinburgh, sometimes rage with uncommon violence.

It has three streets, almost a mile in length, running from east to west, intersected with cross streets at proper distances.

Edinburgh. distances: The most northerly, called *Queen's Street*, is 100 feet broad, and commands an extensive prospect of the Forth, the county of Fife, and the shipping in the river. That called *George's Street*, which is in the middle, is no less than 115 feet wide. It is terminated at each end by two very elegant and extensive squares; that on the east end is called *St Andrew's Square*; the other, tho' not yet finished, nor indeed begun, is to be named *Charlotte's Square*. Prince's street is the most southerly; and extends from the northern extremity of the bridge, quite to the west end of the town; though as that is not yet finished, we cannot say whether it will be done exactly according to the plan laid down, as there has been a proposal made by a private person of continuing the whole a considerable way farther to the westward, to end in a circus. The reason given for this proposed innovation is, that the road to Glasgow and other parts in the west will thus be rendered more easy, as it will then lie along the new bridge over the Water of Leith at Bell's mills, which is much more convenient than that just now in use.

The most remarkable public buildings in Edinburgh are:

1. *The Castle*. This stands on a high rock, accessible only on the east side. On all others it is very steep, and in some places perpendicular. It is about 300 feet high from its base: so that, before the invention of artillery, it might well have been deemed impregnable; though the event showed that it was not.—The entry to this fortress is defended by an outer barrier of palisadoes; within this is a dry ditch, draw-bridge, and gate, defended by two batteries which flank it; and the whole is commanded by an half-moon mounted with brass cannon, carrying balls of 12 pounds. Beyond these are two gate-ways, the first of which is very strong, and has two portcullises. Immediately beyond the second gate-way, on the right hand, is a battery mounted with brass cannon, carrying balls of 12 and 18 pounds weight. On the north side are a mortar and some gun batteries.—The upper part of the castle contains a half-moon battery, a chapel, a parade for exercise, and a number of houses in the form of a square, which are laid out in barracks for the officers. Besides these there are other barracks sufficient to contain 1000 men; a powder magazine bomb-proof; a grand arsenal, capable of containing 8000 stand of arms; and other apartments for the same use, which can contain 22,000 more: so that 30,000 stand of arms may be conveniently lodged in this castle.—On the east side of the square above mentioned, were formerly royal apartments; in one of which king James VI. was born, and which is still shown to those who visit the castle. In another, the regalia of Scotland were deposited on the 26th of March 1707, and are said to be still kept there; but they are never shown to any body. Hence a suspicion has arisen that they have been carried to London; which is the more confirmed, as the keeper of the jewel-office in the tower of London shows a crown, which he calls that of Scotland; and it is certain that the door of what is called the *Crown-room* has not been publicly known to be opened since the union.

The governor of the castle is generally a nobleman, whose place is worth about 1000*l.* a-year; and that of deputy-governor, 500*l.* This last resides in the house ap-

pointed for the governor, as the latter never inhabits it. Edinburgh. There is also a fort-major, a store-keeper, master gunner, and chaplain; but as this last does not reside in the castle, worship is seldom performed in the chapel. The parliament-house was formerly included in the great square on the top, and the royal gardens were in the marsh afterwards called the *North-loch*; the king's stables being on the south side, where the houses still retain the name, and the place where the barns were still retain the name of *Castle-barns*.

The castle is defended by a company of invalids, and four or five hundred men belonging to some marching regiment, though it can accommodate 1000, as above-mentioned; and this number has been sometimes kept in it. Its natural strength of situation was not sufficient to render it impregnable, even before the invention of artillery, as we have already observed; much less would it be capable of securing it against the attacks of a modern army well provided with cannon. It could not, in all probability, withstand, even for a few hours, a well directed bombardment: for no part but the powder-magazine is capable of resisting these destructive machines; and the splinters from the rock on which the castle is built, could not fail to render them still more formidable. Besides, the water of the well, which is very bad, and drawn up from a depth of 100 feet, is apt to subside on the continued discharge of artillery, which produces a concussion in the rock.

2. *The Palace of Holyrood-house*. This, though much neglected, is the only royal habitation in Scotland that is not entirely in ruins. It is a handsome square of 230 feet in the inside, surrounded with piazzas. The front, facing the west, consists of two double towers joined by a beautiful low building, adorned with a double balustrade above. The gateway in the middle is decorated with double stone columns, supporting a cupola in the middle, representing an imperial crown, with a clock underneath. On the right hand is the great staircase which leads to the council chamber and the royal apartments. These are large and spacious, but unfurnished: in one of them the Scotch peers meet to elect 16 of their number to represent them in parliament. The gallery is on the left hand, and measures 150 feet by 27½. It is adorned with the supposed portraits of all the kings of Scotland. In the apartments of the duke of Hamilton, which he possesses as hereditary keeper of the palace, queen Mary's bed of crimson damask, bordered with green fringes and tassels, is still to be seen, but almost reduced to rags. Here also strangers are shown a piece of wainscot hung upon hinges, which opens to a trap-stair communicating with the apartments below. Through this passage Darnley and the other conspirators rushed in to murder the unhappy Rizzio. Towards the outward door of these apartments are large dusky spots on the floor, said to be occasioned by Rizzio's blood, which could never be washed out. In the lodgings assigned to lord Dunmore is a picture by Van Dyke, esteemed a masterly performance, of king Charles I. and his queen going a-hunting. There are likewise the portraits of their present majesties at full length by Ramsay. The lodgings above the royal apartments are occupied by the duke of Argyll as heritable master of the household.

The front of this palace is two stories high; the roof

Edinburgh roof flat; but at each end the front projects, and is ornamented with circular towers at the angles. Here the building is much higher, and the rest of the palace is three stories in height. The north-west towers were built by James V. for his own residence: his name is still to be seen below a niche in one of these towers. During the minority of queen Mary, this palace was burned by the English; but soon after repaired and enlarged beyond its present size. At that time it consisted of five courts, the most westerly of which was the largest. It was bounded on the east by the front of the palace, which occupied the same space it does at present; but the building itself extended further to the south. At the north-west corner was a strong gate, with Gothic pillars, arches, and towers, part of which was not long ago pulled down. Great part of the palace was burnt by Cromwell's soldiers; but it was repaired and altered into the present form after the Restoration. The fabric was planned by Sir William Bruce a celebrated architect, and executed by Robert Mylne mason. The environs of the palace afford an asylum for insolvent debtors; and adjoining to it is an extensive park, all of which is a sanctuary.

The abbey church was formerly called the *monastery of Holyrood-house*, and built by king David I. in 1128. He gave it the name of *Holyrood-house*, in memory, as is said, of his deliverance from an enraged hart, by the miraculous interposition of a cross from heaven. This monastery he gave to the canons regular of St Augustine: on whom he also bestowed the church of Edinburgh castle, with those of St Cuthbert's, Corstorphin, and Libberton, in the shire of Mid-Lothian, and of Airth in Stirlingshire; the priories of St Mary's Isle in Galloway, of Blantyre in Clydesdale, of Rowadill in Ross, and three others in the Western Isles. To them he also granted the privilege of erecting a borough between the town of Edinburgh and the church of Holyrood-house. From these canons it had the name of the *Canongate*, which it still retains. In this new borough they had a right to hold markets. They had also portions of land in different parts, with a most extensive jurisdiction, and right of trial by duel, and fire and water ordeal. They had also certain revenues payable out of the exchequer and other funds, with fishings, and the privilege of erecting mills on the water of Leith, which still retain the name of *Canon-mills*. Other grants and privileges were bestowed by succeeding sovereigns; so that it was deemed the richest religious foundation in Scotland. At the Reformation, its annual revenues were, 442 bolls of wheat, 640 bolls of bear, 560 bolls of oats, 500 capons, two dozen of hens, as many salmon, 12 loads of salt; besides a great number of swine, and about 250l. sterling in money. At the Reformation, the superiority of North Leith, part of the Pleasance, the barony of Broughton, and the Canongate, was vested in the earl of Roxburgh; and were purchased from him by the town-council of Edinburgh in 1636. In 1544, the church suffered considerably by the invasion of the English; but was speedily repaired. At the Restoration, king Charles II. ordered the church to be set apart as a chapel-royal, and prohibited its use as a common parish church for the future. It was then fitted up in a very elegant manner. A throne was

erected for the sovereign, and 12 stalls for the knights of the order of the thistle: but as masons had been celebrated in it in the reign of James VII. and it had an organ, with a spire, and a fine chime of bells on the west side, the Presbyterians at the revolution entirely destroyed its ornaments, and left nothing but the bare walls.—Through time, the roof of the church became ruinous; on which the duke of Hamilton represented its condition to the barons of exchequer, and craved that it might be repaired. This request was complied with: but the architect and mason who were employed, covered the roof with thick flag-stones, which soon impaired the fabric; and on the 2d of December 1768, the roof fell in. Since that time, no attempt has been made to repair it, and it is now entirely fallen to ruin.

The ruins of this church, however, are still sufficient to discover the excellency of the workmanship. Here some of the king's of Scotland are interred; and an old kind of curiosity has been the occasion of exposing some bones said to be those of lord Darnley and a countess of Roxburgh who died several hundred years ago. Those said to belong to the former were very large, and the latter had some flesh dried upon them. The chapel was fitted up in the elegant manner above mentioned by James VII. but such was the enthusiasm of the mob, that they not only destroyed the ornaments, but tore up even the pavement, which was of marble.

To the eastward of the palace is the bowling-green, now entirely in disorder; and behind it is a field called *St Ann's Yards*. Beyond this is a piece of ground called the *King's Park*; which undoubtedly was formerly overgrown with wood, though now there is not a single tree in it. It is about three miles in circumference; and was first inclosed by James V. It contains the rocky hills of *Arthur's Seat* and *Salisbury Craigs*, which last afford an inexhaustible stone quarry; and upon the north side of the hill stands an old ruinous chapel, dedicated to St Anthony. The stones are used in building, as well as for paving the streets and high-ways. The park was mortgaged to the family of Haddington for a debt due to them; and by the present earl has been divided into a number of inclosures by stone-dykes raised at a considerable expence. A good number of sheep and some black cattle are fed upon it; and it is now rented at 1500 l. annually.

3. *St Giles's Church* is a beautiful Gothic building, measuring in length 206 feet. At the west end, its breadth is 110; in the middle, 129; and at the east end, 76 feet. It has a very elevated situation, and is adorned with a lofty square tower; from the sides and corners of which rise arches of figured stonework: these meeting with each other in the middle, complete the figure of an imperial crown, the top of which terminates in a pointed spire. The whole height of this tower is 161 feet.

This is the most ancient church in Edinburgh. From a passage in an old author called *Simson Dunelmensis*, some conjecture it to have been built before the year 854; but we do not find express mention made of it before 1359. The titular saint of this church, and of Edinburgh, was St Giles, a native of Greece. He lived in the sixth century, and was descended of an illustrious family. On the death of his parents, he

Edinburgh gave all his estate to the poor; and travelled into France, where he retired into a wilderness near the conflux of the Rhone with the sea, and continued there three years. Having obtained the reputation of extraordinary sanctity, various miracles were attributed to him; and he founded a monastery in Languedoc, known long after by the name of *St Giles's*.—In the reign of James II. Mr Preston of Gorton, a gentleman whose descendants still possess an estate in the county of Edinburgh, got possession of the arm of this saint; which relic he bequeathed to the church of Edinburgh. In gratitude for this donation, the magistrates granted a charter in favour of Mr Preston's heirs, by which the nearest heir of the name of Preston was entitled to carry it in all processions. At the same time, the magistrates obliged themselves to found an altar in the church of *St Giles's*, and appoint a chaplain for celebrating an annual mass for the soul of Mr Preston; and likewise, that a tablet, containing his arms, and an account of his pious donation, should be put up in the chapel.—*St Giles's* was first simply a parish church, of which the bishop of Lindisfarne or Holy Island, in the county of Northumberland, was patron. He was succeeded in the patronage by the abbot and canons of Dunfermline, and they by the magistrates of Edinburgh. In 1466, it was erected into a collegiate church by James III.—At the Reformation, the church was, for the greater convenience, divided into several parts. The four principal ones are appropriated to divine worship, the lesser ones to other purposes. At the same time the religious utensils belonging to this church were seized by the magistrates. They were,—*St Giles's* arm, enshrined in silver, weighing five pounds three ounces and an half; a silver chalice, or communion-cup, weighing 23 ounces; the great *eucharist* or communion-cup, with *golden ewick and flukes*; two crucets of 25 ounces; a golden bell, with a heart, of four ounces and a half; a golden unicorn; a golden pix, to keep the host; a small golden heart, with two pearls; a diamond ring; a silver chalice, patine, and spoon, of 32 ounces and a half; a communion-table-cloth of gold brocade; *St Giles's* coat, with a little piece of red velvet which hung at his feet; a round silver *eucharist*: two silver censers, of three pounds fifteen ounces; a silver ship for incense; a large silver cross, with its base, weighing sixteen pounds thirteen ounces and a half; a triangular silver lamp; two silver candlesticks, of seven pounds three ounces; other two, of eight pounds thirteen ounces; a silver chalice gilt, of 20½ ounces; a silver chalice and cross, of 75 ounces; besides the priests robes, and other vestments, of gold brocade, crimson velvet embroidered with gold, and green damask.—These were all sold, and part of the money applied to the repairs of the church; the rest was added to the funds of the corporation.

In the steeple of *St Giles's* church are three large bells brought from Holland in 1621; the biggest weighing 2000 lb. the second 700, and the third 500. There are also a set of music bells, which play every day between one and two o'clock, or at any time in the case of rejoicings. The principal division is called the *High Church*, and has been lately repaired and new seated. There is a very elegant and finely ornamented seat for his majesty, with a canopy supported by four Corinthian pillars decorated in high taste.

This feat is used by the king's commissioner during the time the General Assembly sits. On the right hand is a seat for the lord high constable of Scotland, whose office it is to keep the peace within doors in his majesty's presence; it being the duty of the earl marshal to do the same without. The seats belonging to the lords of council and session are on the right of the lord high constable; and on the left of the throne was a seat for the lord high chancellor of Scotland; but that office being now abolished, the seat is occupied by others. On the left of this sit the barons of exchequer; and, to the left of them, the lord provost, magistrates, and town-council. The pulpit, king's seat, and galleries, are covered with crimson velvet with gold and silk fringes.

The aisle of *St Giles's* church is fitted up with seats for the general assembly who meet here; and there is a throne for his majesty's commissioner with a canopy of crimson silk damask, having the king's arms embroidered with gold, presented by the late lord Cathcart to his successor in office. In this church is a monument dedicated to the memory of lord Napier, baron of Merchilton, well known as the inventor of logarithms; a second to the earl of Murray, regent of Scotland during the minority of James VI.; and a third to the great marquis of Montrose.

4. *The Parliament House*, in the great hall of which the Scottish parliament used to assemble, is a magnificent building. The hall is 123 feet long and 42 broad, with a fine arched roof of oak, painted and gilded. In this the lawyers and agents now attend the courts, and single judges sit to determine causes in the first instance, or to prepare them for the whole court, who sit in an inner room formerly appropriated to the privy-council. In a nich of the wall is placed a fine marble statue of president Forbes, erected at the expence of the faculty of advocates. There are also full length portraits of king William III. queen Mary his consort, and queen Anne, all done by Sir Godfrey Kneller; also of George I. John duke of Argyll, and Archibald duke of Argyle, by Mr Aikman of Cairney.

Above stairs are the court of exchequer and treasury chamber, with the different offices belonging to that department; and below is one of the most valuable libraries in Great Britain, belonging to the faculty of advocates. Besides 30,000 printed volumes, there are many scarce and valuable manuscripts, medals, and coins: here is also an entire mummy in its original chest, presented to the faculty (at the expence of 300 l.) by the earl of Morton, late president of the royal society. As these rooms are immediately below the hall where the parliament sat, they are subject to a search by the lord high constable of Scotland ever since the gun-powder plot; and this is specified in the gift from the city to the faculty. This library was founded, in the year 1682, by Sir George Mackenzie lord advocate. Among other privileges, it is intitled to a copy of every book entered in stationer's hall. Before the great door is a noble equestrian statue of *Ch. II.* the proportions of which are reckoned exceedingly just. Over the entrance are the arms of Scotland, with Mercy and Truth on each side for supporters.

The court of session, the supreme tribunal in Scotland, consists of 15 judges, who sit on a circular bench, clothed in purple robes turned up with crimson velvet. Six of these are lords of the judiciary, and go the circuit

Edinburgh. cuit twice a-year; but, in that capacity, they wear scarlet robes turned up with white fatten.

5. *The Tolbooth* was erected in 1561, not for the purposes merely of a prison, but likewise for the accommodation of the parliament and other courts; but it has since become so very unfit for any of these purposes, that it is now proposed to pull it down and rebuild it in some other place, especially as it is very inconvenient in its present situation on account of its incumbering the street. The provost is captain of the tolbooth, with a gaoler under him: and the latter has a monopoly of all the provisions for the prisoners; a circumstance which must certainly be considered as a grievous oppression, those who are least able to purchase them being thus obliged to do so at the highest price. There is a chaplain who has a salary of 30*l.* a-year.

6. There is a Hall in the Writers Court belonging to the clerks to his majesty's signet, where there is also an office for the business of the signet. The office of keeper of the signet is very lucrative, and he is allowed a deputy and clerks under him. Before any one enters into this society he must attend the college for two years, and serve five years as an apprentice to one of the society. There is a good library belonging to this hall, which is rapidly increasing, as every one who enters must pay 10*l.* towards it. He pays also 100*l.* of apprentice-fee, and 100*l.* when he enters.

7. *The Exchange* is a large and elegant building, with a court of about 90 feet square in the middle. On the north side are piazzas where people can walk under cover, the other three sides being laid out in shops; but the merchants have never made use of it to meet in, still standing in the street as formerly. The back part of the building is used for the general customhouse of Scotland, where the commissioners meet to transact business. They have above 20 offices for the different departments, to which the access is by a hanging stair 60 feet in height. In looking over the window before he ascends this stair, a stranger is surprised to find himself already 40 feet from the ground, which is owing to the declivity on which the exchange is built. For the customhouse rooms the city receives a rent of 1*l.* per day.

The Trustees Office for the improvement of fisheries and manufactures in Scotland is in the south-west corner of the exchange; the fund under their management being part of the equivalent money given to Scotland at the Union. This is distributed in premiums amongst those who appear to have made any considerable improvement in the arts.

7. *The North Bridge*, which forms the main passage of communication betwixt the Old and New Towns, was founded, as has already been observed, in 1763 by Provost Drummond; but the contract for building it was not signed till August 21st 1765. The architect was Mr William Mylne, who agreed with the town-council of Edinburgh to finish the work for 10,140*l.* and to uphold it for 10 years. It was also to be finished before Martinmas 1769: but on the 3d of August that year, when the work was nearly completed, the vaults and side-walls on the south fell down, and five people were buried in the ruins. This misfortune was occasioned by the foundation having been laid, not upon the solid earth, but upon the rubbish of the houses

which had long before been built on the north side of the high-street, and which had been thrown out into the hollow to the northward. Of this rubbish there were no less than eight feet between the foundation of the bridge and the solid earth. Besides this deficiency in the foundation, an immense load of earth which had been laid over the vaults and arches in order to raise the bridge to a proper level, had no doubt contributed to produce the catastrophe above mentioned.—The bridge was repaired, by pulling down some parts of the side-walls, and afterwards rebuilding them; strengthening them in others with chain-bars; removing the quantity of earth laid upon the vaults, and supplying its place with hollow arches, &c. The whole was supported at the south end by very strong buttresses and counterforts on each side; but on the north it has only a single support.—The whole length of the bridge, from the High-street in the Old Town to Prince's-street in the New, is 1125 feet; the total length of the piers and arches is 310 feet. The width of the three great arches is 72 feet each; of the piers, 13½ feet; and of the small arches, each 20 feet. The height of the great arches, from the top of the parapet to the base, is 68 feet; the breadth of the bridge within the wall over the arches is 40 feet, and the breadth at each end 50 feet.—On the southern extremity of this bridge stands the General Post Office for Scotland; a neat plain building, with a proper number of apartments for the business, and a house for the secretary.

The communication betwixt the two towns by means of this bridge, though very complete and convenient for such as lived in certain parts of either, was yet found insufficient for those who inhabited the western districts. Another bridge being therefore necessary, it was proposed to fill up the valley occasionally with the rubbish dug out in making the foundations of houses in the New Town; and so great was the quantity, that this was accomplished so as to be fit for the passage of carriages in little more than four years and an half.

8. *The South Bridge* is directly opposite to the other, so as to make but one street, crossing that called the *High-street* almost at right angles. It consists of 19 arches of different sizes: but only one of them is visible, viz. the large one over the Cowgate; and even this is small in comparison with those of the North Bridge, being no more than 30 feet wide and 31 feet high. On the south it terminates at the University on one hand, and the Royal Infirmary on the other. The Tron Church, properly called *Christ Church*, stands at the northern extremity, facing the High-street, and in the middle of what is now called *Hunter's Square*, in memory of the late worthy chief magistrate who planned these improvements, but did not live to see them executed. On the west side of this square the Merchant Company have built a very handsome hall for the occasional meetings of their members. This bridge was erected with a design to give an easy access to the great number of streets and squares on the south side, as well as to the country on that quarter from whence the city is supplied with coals. The street on the top is supposed to be as regular as any in Europe; every house being of the same dimensions, excepting that between every two of the ordinary construction there is one with a pediment on the top, in order to prevent that

Edinburgh—that lameness of appearance which would otherwise take place. So great was the rage for purchasing ground on each side of this bridge for building, that the areas sold by public auction at 50*l.* per foot in front. By this the community will undoubtedly be considerable gainers; and the proprietors hope to indemnify themselves for their extraordinary expence by the vast sale of goods supposed to attend the shops in that part of the town; though this seems somewhat more dubious than the former.

9. *The Concert Hall*, called also *St Cecilia's Hall*, stands in Niddery's-street; and was built in 1762, after the model of the great opera-theatre in Parma. The plan was drawn by Sir Robert Mylne, architect of Blackfriars bridge. The musical room is of an oval form, the ceiling being a concave elliptical dome, lighted from the top by a lantern. The seats are ranged in the form of an amphitheatre; and are capable of containing 500 persons, besides leaving a large area in the middle of the room. The orchestra is at the upper end, and is terminated by an elegant organ.

The musical society was first instituted in the year 1728. Before that time, several gentlemen had formed a weekly club at a tavern kept by one Steil, a great lover of music, and a good singer of Scots songs. Here the common entertainment consisted in playing on the harpichord and violin the concertos and sonatas of Handel, just then published. The meeting, however, soon becoming numerous, they instituted, in the year above mentioned, a society of 70 members, for the purpose of holding a weekly concert. The affairs of the society are regulated by a governor, deputy-governor, treasurer, and five directors, who are annually chosen by the members. The meetings have been continued ever since that time on much the same footing as at first, and the number of members is now increased to 200. The weekly concerts are on Friday; the tickets being given gratis by the directors, and attention paid in the first place to strangers. Oratorios are occasionally performed throughout the year; and the principal performers have also benefit concerts. The band are excellent in their several departments; and several of the members are also good performers, and take their part in the orchestra. There are always many applications on the occasion of a vacancy by the death of any of the members or otherwise; and such is generally the number of candidates, that it is no easy matter to get in.

10. *The University*. In the year 1581, a grant was obtained from king James VI. for founding a college or university within the city of Edinburgh; and the citizens, aided by various donations from well disposed persons, purchased a situation for the intended new college, consisting of part of the areas, chambers, and church of the collegiate provostry and prebends of the Kirk-a-field, otherwise called *Templum et Præfectura Sanctæ Mariæ in campis*, lying on the south side of the city. Next year, a charter of confirmation and erection was obtained also from king James VI. from which the college to be built did afterwards derive all the privileges of an university.

In 1583, the provost, magistrates, and council, the patrons of this new institution, prepared the place in the best manner they could for the reception of teachers and students; and in the month of October

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the same year, Robert Rollock, whom they had in-
vited from a professorship in St Salvator's College in the university of St Andrew's, began to teach in the new college of Edinburgh. Other professors were soon after elected; and in the year 1586, Rollock was appointed principal of the college, and the following year also professor of divinity, immediately after he had conferred the degree of M. A. on the students who had been under his tuition for four years. The offices of principal and professor of divinity remained untill the year 1620.

In the 1617, king James VI. having visited Scotland after his accession to the crown of England, commanded the principal and regents of the college of Edinburgh to attend him in Stirling castl; and after they had there held a solemn philosophical disputation in the royal presence, his majesty was so much satisfied with their appearance, that he desired their college for the future might be called *The College of King James*, which name it still bears in all its diplomas or public deeds.

For several years the college consisted only of a principal, who was also professor of divinity, with four regents or professors of philosophy. Each of these regents instructed one class of students for four years, in Latin, Greek, school logic, mathematics, ethics, and physics, and graduated them at the conclusion of the fourth course. A professor of humanity or Latin was afterwards appointed, who prepared the students for entering under the tuition of the regents; also a professor of mathematics, and a professor of Hebrew or Oriental languages. It was not till about the year 1710 that the four regents began to be confined each to a particular profession; since which time they have been commonly styled *Professors of Greek, Logic, Moral, Philosophy, and Natural Philosophy*.—The first medical professors instituted at Edinburgh, were Sir Robert Sibbald and Doctor Archibald Pitcairn, in the year 1685*. Their, however, were only titular professors; and for 30 years afterwards, a summer-lecture on the official plants, and the dissection of a human body once in two or three years, completed the whole course of medical education at Edinburgh.—In 1720, an attempt was made to teach the different branches of physic regularly; which succeeded so well, that, ever since, the reputation of the university as a school for medicine hath been constantly increasing, both in the island of Britain, and even among distant nations.

The college is endowed with a very fine library, founded in 1580 by Mr Clement Little advocate, who bequeathed it to the town-council. They ordered a house to be built for it in the neighbourhood of St Giles's church, where it was for some time kept under the care of the eldest minister of Edinburgh, but was afterwards removed to the college. This collection is enriched, as well as others of a similar kind, by receiving a copy of every book entered in Stationer's hall, according to the statute for the encouragement of authors. Besides this, the only fund it has is the money paid by all the students at the university, except those of divinity, upon their being matriculated; and a sum of 5*l.* given by each professor at his admission. The amount of these sums is uncertain, but has been estimated at about 150*l.* annually. The students

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Edinburgh. of divinity, who pay nothing to this library, have one belonging to their own particular department.

Here are shown two skulls, one almost as thin as paper, pretended to be that of the celebrated George Buchanan, and, by way of contrast, another said to have been that of an idiot, and which is excessively thick. Here also are preserved the original protest against the council of Constance for burning John Huss and Jerom of Prague in 1417; the original contract of queen Mary with the dauphin of France, and some valuable coins and medals. There are also several portraits; particularly of Robert Pollock the first principal of the university, king James VI. Lord Napier the inventor of logarithms, John Knox, principal Carstairs, Mr Thomfou the author of the Seasons, &c. The museum contains a good collection of natural curiosities, the number of which is daily increasing. The anatomical preparations are worth notice, as are also those belonging to the professor of midwifery.

The celebrity of this college has been greatly owing to the uniform attention of the magistracy in filling up the vacant chairs with men of known abilities in their respective departments. Greatly to their honour, too, they have been no less attentive to the instituting of new professorships from time to time as the public seemed to demand them. At present (anno 1790), the Senatus Academicus consists of the following members, arranged according to the different faculties.

Faculty of THEOLOGY.

William Robertson, D. D. Principal of the College.
Andrew Hunter, D. D. Professor of Divinity.
Thomas Hardy, D. D. Regius Professor of Church-History.
James Robertson, D. D. Professor of Oriental Languages, and Emeritus Secretary and Librarian.

Faculty of LAW.

Robert Dick, Advocate, Professor of Civil Law.
Allan Macnoshie, Advocate, Professor of Public Law.
Alexander Frazer Tytler, Advocate, Professor of Universal Civil History, and of Greek and Roman Antiquities.
David Hume, Advocate, Professor of Scots Law.

Faculty of MEDICINE.

Alexander Monro, M. D. Professor of Medicine, and of Anatomy and Surgery.
James Gregory, M. D. Professor of the Practice of Physic.
Joseph Black, M. D. Professor of Medicine and Chemistry.
Francis Home, M. D. Professor of Medicine and Materia Medica.
Andrew Duncan, M. D. Professor of the Theory of Physic.
Daniel Rutherford, M. D. Professor of Medicine and Botany.
Alexander Hamilton, M. D. Professor of Midwifery.

Faculty of ARTS.

George Stewart, LL. D. Emeritus Professor of Humanity.
Adam Ferguson, LL. D. Emeritus Professor of Moral Philosophy, and joint Professor of Mathematics.

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Hugh Blair, D. D. Emeritus Professor of Rhetoric and Belles Lettres.

Andrew Dalziel, A. M. Professor of Greek, and Secretary and Librarian.

John Robison, A. M. Professor of Natural Philosophy.
Dugald Stewart, A. M. Professor of Moral Philosophy.

John Hill, LL. D. Professor of Humanity.

John Bruce, A. M. Joint Professor of Logic.

John Walker, D. D. Regius Professor of Natural History, and Keeper of the Museum.

William Greenfield, A. M. Professor of Rhetoric and Belles Lettres.

John Playfair, A. M. Professor of Mathematics.

Robert Blair, M. D. Regius Professor of Practical Astronomy.

James Finlayson, A. M. Joint Professor of Logic.

Andrew Coventry, M. D. Professor of Agriculture.

Andrew Fife, Principal Janitor and Mace.

William Stewart, under Janitor.

N. B. There are only about 50 burfers in this university, and these do not exceed 121. *per annum.*

The number of students during the last session of the college, from October 10. 1789 to May 6. 1790, was nearly as follows:

Students of Divinity	-	130
— Law	-	100
— Physic	-	440
General Classes	-	420

In all 1090

The old buildings being very mean, and unfit for the reception of so many professors and students, and quite unsuitable to the dignity of such a flourishing university, as well as inconsistent with the improved state of the city, the Lord Provost, Magistrates, and Council, set on foot a subscription for erecting a new structure, according to a design of Robert Adam, Esq; architect. Part of the old fabric has in consequence been pulled down, and the new building is already in considerable forwardness. The foundation stone was laid on Monday the 16th of November, with great solemnity, by the Right Hon. Francis Lord Napier, grand master mason of Scotland, in the presence of the Right Hon. the Lord Provost, Magistrates, and Town-Council of the city of Edinburgh, with the Principal, Professors, and Students of the university of Edinburgh, a number of Nobility and Gentry, and the Masters, Officers, and Brethren, of all the lodges of free masons in the city and neighbourhood, who marched in procession from the Parliament-House down the High-Street. After the different masonic ceremonies were performed, two crystal-bottles, cast on purpose at the glass-house of Leith, were deposited in the foundation-stone. In one of these were put different coins of the present reign, each of them being previously enveloped in crystal, in such an ingenious manner, that the legend on the coins could be distinctly read without breaking the crystal. In the other bottle were deposited seven rolls of vellum, containing a short account of the original foundation and present state of the university, together with several other papers, in particular the different newspapers, containing advertisements relative to the college, &c. and a list of the names of the Principal and Professors, also of the

Edinburgh present Lord Provost and Magistrates, and Officers of the grand lodge of Scotland. The bottles being carefully sealed up, were covered with a plate of copper wrapt in black tin; and upon the under side of the copper were engraved the arms of the city of Edinburgh and the university; likewise the arms of the Right Hon. Lord Napier, grand master mason of Scotland. Upon the upper side, a Latin inscription, of which the following is a copy:

ANNUENTE DEO OPT. MAX.
 REGNANTE GEORGIO III. PRINCIPE
 MUNIFICENTISSIMO;
 ACADEMIÆ EDINBURGENSIS
 AEDIBUS,
 INITIO QUIDEM HUMILLIMIS,
 ET JAM, POST DUO SEcula, PENE RUINOSIS;
 NOVI HUIUS AEDIFICII,
 UBI COMMODITATI SINUL ET ELEGANTIE,
 TANTO DOCTRINARUM DOMICILIO
 DIGNÆ,
 CONSULERETUR,
 PRIMUM LAPIDEM POSUIT,
 PLAUDENTE INGENTI OMNIUM ORDINUM
 FREQUENTIA,
 VIR NOBILISSIMUS
 FRANCISCUS DOMINUS NAPIER,
 REIPUB. ARCHITECTONICÆ APUD SCOTOS
 CURIO MAXIMUS;
 XVI. KAL. DECEMB.
 ANNO SALUTIS HUMANÆ MDCCCLXXXIX.
 AERÆ ARCHITECTONICÆ IOHANNES CLXXIX.
 CONSULE THOMA ELDER,
 ACADEMIÆ PRÆFECTO GULIELMO
 ROBERTSON,
 ARCHITECTO ROBERTO ADAM.
 Q. F. F. Q. S.

The east and west fronts of this pile are to extend 255 feet, and the south and north 358. There are to be houses for the principal and six or seven of the professors. The library is to be a room of 160 feet in length; the museum for natural curiosities is to be of the same extent; and the dimensions of the hall for degrees and public exercises are about 90 feet by 30. There are likewise to be an elegant and most convenient anatomical theatre; a chemical laboratory; and large rooms for instruments and experiments for the professors of mathematics, natural philosophy, and agriculture. The whole when finished, if not the most splendid structure of the sort in Europe, will however be the completest and most commodious; and it will do the utmost honour to the genius of the architect and to the munificence of the public. About 16,000 is already subscribed; and there is no doubt that the aid of parliament will be granted to complete the work.

The botanical garden belonging to the university is situated at the distance of about a mile, on the road between Edinburgh and Leith. It consists of about five acres of ground; and is furnished with a great variety of plants, many of them brought from the most distant quarters of the globe. The professor is botanist to the king, and receives a salary of 120l. annually for the support of the garden. A monument, to the memory of the celebrated botanist Linnæus, was erected here by the late Dr Hope, who first planned the garden, and brought it to perfection.

The university of Edinburgh, like the others in this **Edinburgh** kingdom, sends one member to the General Assembly of the church of Scotland; and the widows of the professors have a right to the funds of those of ministers, the professors being trustees on that fund along with the presbytery of Edinburgh.

11. *The Royal Infirmary* was first thought of by the college of physicians in 1725. A fishing company happening to be dissolved at that time, the partners contributed some of their stock towards the establishment of the infirmary. A subscription was also set on foot, and application made to the General Assembly to recommend the same throughout their jurisdiction. This was readily complied with, and the assembly passed an act for that purpose; but very little regard was paid to it by the clergy. Notwithstanding this, however, 2000l. being procured, a small house was opened for the reception of the sick poor in August 1729. In 1736, the contributors towards the infirmary were erected into a body corporate by royal statute; and after this the contributions increased very considerably: by which means the managers were enabled to enlarge their scheme from time to time; and at last to undertake the present magnificent structure, the foundation of which was laid in 1738. During 25 years, when this institution was in its infancy, Lord Hopetoun bestowed upon it an annuity of 400l. In 1750, Doctor Archibald Ker bequeathed to this incorporation 200l. a-year in the island of Jamaica. In 1755, the lords of the treasury made a donation to it of 8000l. which had been appointed for the support of invalids. In return for this, the managers of the infirmary constantly keep 60 beds in readiness for the reception of sick soldiers. This year also sick servants began to be admitted into the infirmary, and a ward was fitted up for their reception.

This institution, however, was more indebted to George Drummond, Esq; than to any other person. He was seven times chosen lord provost of Edinburgh; and always directed his attention to the improvement of the city, particularly to that of the royal infirmary. So sensible were the managers of their obligations to him, that, in their hall, they erected a bust of him with this inscription, "George Drummond, to whom this country is indebted for all the benefit which it derives from the Royal Infirmary."—In 1748, the stock of the infirmary amounted to 5000l; in 1755, to 7076l. besides the estate left by Doctor Ker; in 1764, to 23,426l.; and in 1778, to 27,074l.

The royal infirmary is attended by two physicians chosen by the managers, who visit their patients daily in presence of the students. All the members of the college of surgeons are also obliged to attend in rotation, according to seniority. If any surgeon declines attendance, he is not allowed to appoint a deputy; but the patients are committed to the care of one of four assistant surgeons, chosen annually by the managers.—From the year 1762 to 1769, there were admitted 6261 patients; which number added to 109 who were in the hospital at the commencement of the year 1762, made, in all, 6370. Of these, 4395 were cured; 358 died; the rest were either relieved, dismissed incurable, for irregularities, or by their own desire, or remained in the hospital.—From 1770 to 1775, the patients annually admitted into the infirmary were, at an average, 1507; of whom 63 died. In 1776, there were admitted 1668,

Edinburgh of whom 57 died; and in 1777, the number admitted was 1593, and of deaths 52. In the year 1786, there were admitted 1822 patients: Of these 1354 were cured; 166 relieved; 84 died; the rest were either relieved, dismissed incurable, for irregularities, or by their own desire.

The building consists of a body and two wings, each of them three stories high, with an attic story and garrets, and a very elegant front. The body is 210 feet long, and 36 broad in the middle, but at the ends only 24 feet broad. There is a butt of king George II. in a Roman dress, above the great door. The wings are 70 feet long, and 24 broad. In the centre is a large stair-case, so wide that sedan chairs may be carried up. In the different wards, 228 patients may be accommodated, each in a different bed. There are cold and hot baths for the patients, and also for the citizens; and to these last the patients are never admitted.

Besides the apartments necessary for the sick, there are others for the officers and servants belonging to the house. There are likewise rooms for the managers, a consulting room for the physicians and surgeons, a waiting-room for the students, and a theatre that will hold upwards of 200 people for performing surgical operations. There is a military ward, supported by the interest of the 8000*l.* already mentioned; and in consequence of which a small guard is always kept at the infirmary. The wards for sick servants are supported by collections at the church doors. Besides the attendance of the royal college of surgeons by rotation, as has already been mentioned, there are two physicians belonging to the house, who are elected by the managers, and have a small salary; there is likewise a house-furgeon and apothecary. Students who attend the infirmary pay 3*l.* 3*s.* annually, which brings in a revenue of about 500*l.* towards defraying the expence of the house. Two wards are set apart for the patients whose cases are supposed to be most interesting; and the physicians give lectures upon them.

12. *The Public Dispensary* was founded by Dr Duncan in 1776, for the poor whose diseases are of such a nature as to render their admission into the infirmary either unnecessary or improper. Here the patients receive advice gratis four days in the week; a register is kept of the diseases of each, and of the effects produced by the medicines employed. All patients not improper for dispensary treatment are admitted on the recommendation of the elder or church-warden of the parish where they reside. The physicians officiate and give lectures gratis; so that the apothecary who lodges in the house, and the medicines, are the only expences attending this useful institution. The expence of the whole is defrayed by public contributions, and from a small annual fee paid by the students who attend the lectures. It is under the direction of a president, two vice-presidents, and 20 directors, elected annually from among the contributors. One guinea entitles a contributor to recommend patients and be a governor for two years, and five guineas gives the same privilege for life.

13. *The High School.* The earliest institution of a grammar-school in Edinburgh seems to have been a-

bout the year 1519. The whole expence bestowed upon the first building of this kind amounted only to about 40*l.* Sterling. Another building, which had been erected for the accommodation of the scholars in 1578, continued, notwithstanding the great increase of their number, to be used for that purpose till 1777. The foundation of the present new building was laid on the 24th of June that year by Sir William Forbes, Grand Master of the Free Masons. The total length of this building is 120 feet from south to north; the breadth in the middle 36, at each end 38 feet. The great hall where the boys meet for prayers, is 68 feet by 30. At each end of the hall is a room of 32 feet by 20, intended for libraries. The building is two stories high, the one 18, the other 17, feet in height. The expence of the whole when finished is reckoned at 4000*l.*

There is a rector and four masters, who teach from 4 to 500 scholars annually. The salaries are trifling, and the fees depend upon the reputation they have obtained for teaching; and as this has been for some years very considerable, the rector's place is supposed to be worth not less than 400*l.* *per annum*, a master's about half that sum. There is a janitor, whose place is supposed to be worth about 70*l.* a year. His business is to take care of the boys on the play-ground; and there is a woman who lives on the spot as under-janitor, whose place may be worth about 25*l.* annually. There is a library, but not large, as each of the boys pays only one shilling annually to its support.

There are four established English schools in Edinburgh; the masters of which receive a small salary, upon express condition that they shall not take above five shillings per quarter from any of their scholars. There are likewise many other private schools in Edinburgh for all languages; and, in general, every kind of education is to be had here in great perfection and at a very cheap rate.

14. *The Mint* is kept up by the articles of union, with all the offices belonging to it, though no money is ever struck here. It stands in the Cowgate, a little to the west of the English church; but is in a ruinous state, though still inhabited by the different officers, who have free houses; and the bell-man enjoys his salary by regularly ringing the bell. This place, as well as the abbey of Holyrood-house, is an asylum for debtors.

15. *The English Chapel* stands near the Cowgate port, and was founded on the 3d of April 1771. The foundation-stone was laid by general Oughton, with the following inscription: *Edifici sacr. Ecclesie episc. Angliae, primum posuit lapidem J. Adolphus Oughton, in architectonicae Scotiae reipub. curio maximus, militem praefectus, regnante Georgio III. tertio Apr. die, A. D. MDCCCLXXI.* It is a plain handsome building, neatly fitted up in the inside, and somewhat resembling the church of St Martin's in the Fields, London. It is 90 feet long, 75 broad, and ornamented with an elegant spire of considerable height. It is also furnished with an excellent bell, formerly belonging to the chapel royal at Holyrood-house, which is permitted to be rung for assembling the congregation; an indulgence not granted to the Presbyterians in England. The expence of the building was defrayed by voluntary subscription;

Edinburgh and, to the honour of the country, people of all persuasions contributed to this pious work. It has already cost 7000*l.* and will require 1000*l.* more to finish the portico. This church is built in a singular manner, viz. from south to north, and the altar-piece stands on the east side. Three clergymen officiate here, of whom the first has 150*l.* the other two 100*l.* each. The altar-piece is finely decorated, and there is a good organ.

There is another Episcopal chapel, but small, in Black-friars wynd, which was founded by Baron Smith in the year 1722. There are also some meetings of the Episcopal church of Scotland, who adhere to their old forms, having fill their bishops and inferior clergy. For some time these were subjected to penal laws, as they refused to take the oath to government, or mention the present royal family in their public prayers: but of late they have conformed, and had their conduct approved of by his Majesty; so that now every denomination of Christians in Britain pray for the royal family on the throne.

16. *Heriot's Hospital* owes its foundation to George Heriot, goldsmith to James VI. who acquired by his business a large fortune. At his death, he left the magistrates of Edinburgh £23,625 l. 10 s. " for the maintenance, relief, and bringing up of so many poor and fatherless boys, freemens fons of the town of Edinburgh," as the above sum should be sufficient for. This hospital is finely situated on the well end of the fourth ridge, almost opposite to the castle, and is the most magnificent building of the kind in Edinburgh. It was founded in July 1628, according to a plan (as is reported) of Iuligo Jones; but the work being interrupted by the civil wars, it was not finished till the year 1650. The expence of the building is said to have been upwards of 30,000 l. (A); and the hospital is now possessed of an income of about 3000 l. a-year; though this cannot be absolutely ascertained, as the rents are paid in grain, and of course must be fluctuating.

It stands on a rising ground to the south-west of the city, and is a square of 162 feet without, having a court 9.4 feet square in the inside, with piazzas on three of the sides. There is a spire with a clock over the gateway, and each corner of the building is ornamented with turrets; but notwithstanding the magnificent appearance of the outside, the inner part is far from being convenient. There is a statue of the founder over the gateway, in the dress of the times, and a very good painting of him in the governor's room, with a picture of the late treasurer Mr Carmichael. There is a chapel 61 feet long and 22 broad, which is now repairing in such a manner as will make it worthy of notice. When Cromwell took possession of Edinburgh after the battle of Dunbar, he quartered his sick and wounded soldiers in this hospital. It was

applied to the same purpose till the year 1658, when
 general Monk, at the request of the governors, re-
 moved the soldiers; and on the 11th of April 1659,
 it was opened for the reception of boys, 30 of whom
 were admitted into it. The August after, they were
 increased to 40; and in 1661, to 52. In 1753 the
 number was raised to 130, and in 1763 to 140; but
 since that time it has decreased.—In this hospital
 the boys are instructed in reading, writing, arith-
 metic, and a knowledge of the Latin tongue. With
 such as choose to follow any kind of trade, an ap-
 prentice-fee of 30*l.* is given when they leave the
 hospital; and those who choose an academical educa-
 tion, have an annuity of 10*l.* a-year bestowed on them
 for four years. The whole is under the oversight
 of the treasurer, who has under him a house-gov-
 ernor, house-keeper, and school-masters.

17. *Watson's Hospital* has its name from the founder George Watson, who was at first clerk to Sir William Dick provost of Edinburgh in 1676, then accountant of the bank of Scotland; after that he became receiver of the city's impost on ale, treasurer to the Merchant's Maiden Hospital, and to the society for propagating Christian knowledge. Dying a bachelor in 1723, he left 12,000*l.* for the maintenance and education of the children and grand-children of decayed members of the merchant company of Edinburgh. The scheme, however, was not put in execution till the year 1738, when the sum originally left had accumulated to 20,000*l.* The present building was then erected, in which about 60 boys are maintained and educated. It is much less magnificent than Heriot's hospital, but the building is far from being despicable. It stands to the southward of the city at a small distance from Heriot's hospital, and was erected at the expence of 5000*l.*: its present revenue is about 1700*l.* It is under the management of the master, assistants, and treasurer of the Merchant Company, four old bailies, the old dean of guild, and the two ministers of the old church. The boys are genteelly clothed and liberally educated. Such as choose an university education are allowed 10*l.* *per annum* for five years; those who go to trades have 20*l.* allowed them for their apprenticeship fee; and at the age of 25 years, if they have behaved properly, and not contracted marriage without consent of the governors, they receive a bounty of 50*l.* The boys are under the immediate inspection of the treasurer, school-master, and house-keeper.

18. *The Merchants Maiden Hospital* was established by voluntary contribution about the end of the last century, for the maintenance of young girls, daughters of the merchants burghesses of Edinburgh. The governors were erected into a body corporate, by act of parliament, in 1707. The annual revenue amounts to 1350*l*. Seventy girls are maintained in it; who, upon leaving the house, receive 3*l*. 6*s*. 8*d*. excepting

(A) It is to be observed, that money then bore 10*l. per cent.* interest.—The above sums are taken from Mr Arnott's History of Edinburgh, who subjoins the following note: "Where Maitland had collected his most erroneous account of George Heriot's effects, we do not know. He makes the sum received, out of Heriot's effects, by the governors of the hospital, to be 43,608*l.* 1*s.* 3*d.* being almost the double of what they really got. This blunder has been the cause of many unjust murmurings against the magistrates of Edinburgh, and even the means of spiriting up law-suits against them."

Edinburgh. a few who are allowed 8l. 6s. 8d. out of the funds of the hospital. The profits arising from work done in the house are also divided among the girls, according to their industry.

19. *The Trades Maiden Hospital* was founded in the year 1704 by the incorporations of Edinburgh, for the maintenance of the daughters of decayed members, on a plan similar to that of the merchants hospital. To this, as well as to the former, one Mrs Mary Erskine, a widow gentlewoman, contributed so liberally, that she was by the governors styled *joint foundress* of the hospital. Fifty girls are maintained in the house, who pay of entry-money 1l. 13s. 4d.; and, when they leave it, receive a bounty of 5l. 11s. 1½d. The revenues are estimated at 600l. a-year.

20. *The Orphan Hospital* was planned in 1732 by Andrew Gairdner merchant, and other inhabitants. It was promoted by the society for propagating Christian knowledge, by other societies, by voluntary subscriptions, and a collection at the church-doors.—In 1733, the managers hired a house, took in 30 orphans, maintained them, gave them instructions in reading and writing, and taught them the weaving business. In 1735, they were erected into a body corporate by the town of Edinburgh: and, in 1742, they obtained a charter of erection from his late majesty, appointing most of the great officers of state in Scotland, and the heads of the different societies in Edinburgh, members of this corporation; with powers to them to hold real property to the amount of 1000l. a-year. The revenue is inconsiderable; but the institution is supported by the contributions of charitable persons. Into this hospital orphans are received from any part of the kingdom. None are admitted under seven, nor continued in it after 14 years of age. At present (1790) about 140 orphans are maintained in it.

The orphan hospital is situated to the east of the north bridge; and is a handsome building, consisting of a body and two wings, with a neat spire, furnished with a clock and two bells. The late worthy Mr Howard admits, that this institution is one of the most useful charities in Europe, and is a pattern for all institutions of the kind. The funds have been considerably increased, and the building greatly improved, through the attention and exertions of Mr Thomas Tod the present treasurer.

21. *The Trinity Hospital*. This was originally founded and amply endowed by king James II.'s queen. At the Reformation, it was stripped of its revenues; but the regent afterwards bestowed them on the provost of Edinburgh, who gave them to the citizens for the use of the poor. In 1595, the town-council purchased from Robert Print, at that time provost of Trinity college, his interest in these subjects; and the transaction was afterwards ratified by James VI. The hospital was then repaired, and appointed for the reception of poor old burghesses, their wives, and unmarried children, not under 50 years of age. In the year 1700, this hospital maintained 54 persons; but, since that time, the number has decreased.—The revenue consists in a real estate of lands and houses, the gross rent of which are 762l. a-year; and 5500l. lent out in bonds at 4 per cent.

This hospital is situated at the foot of Leith-wynd, and maintains about 50 of both sexes, who are com-

fortably lodged, each having a room for themselves. Edinburgh. They are supplied with roast or boiled meat every day for dinner, have money allowed them for clothes, and likewise a small sum for pocket-money. There is a small library for their amusement, and they have a chaplain to say prayers. There are some out-pensioners who have 6l. a-year, but these are discouraged by the governors. The funds are under the management of the town-council.

22. *The Charity Workhouse* was erected in 1743 by voluntary contribution. It is a large plain building, on the south side of the city. Here the poor are employed, and are allowed twopence out of every shilling they earn. The expence of this institution is supposed not to be less than 4000l. annually; as about 700 persons of both sexes, including children, are maintained here, each of whom cannot be reckoned to cost less than 4l. 10s. *per annum*; and there are besides 300 out-pensioners. The only permanent fund for defraying this expence is a tax of two *per cent.* on the valued rents of the city, which may bring in about 600l. annually; and there are other funds which yield about 400l. The rest is derived from collections at the church doors and voluntary contributions; but as these always fall short of what is requisite, recourse must frequently be had to extraordinary collections. The sum arising from the rents of the city, however, is constantly increasing; but the members of the College of Justice are exempted from the tax.

There are two other charity workhouses in the suburbs, much on the same plan with that now described; one in the Canongate, and the other in St Cuthbert's or West Kirk parish.

To this account of the charitable establishments in Edinburgh, we shall add that of some others; which, though not calculated to decorate the city by any public building, are perhaps no less deserving of praise than any we have mentioned. The first is that of Captain William Horn, who left 3500l. in trust to the magistrates, the annual profits to be divided on Christmas day to poor out-day labourers, who must at that season of the year be destitute of employment; five pounds to be given to those who have large families, and one half to those who have smaller.

Another charity is that of Robert Johnston, L.L.D. of London, who in 1640 left 3000l. to the poor of this city; 1000l. to be employed in setting them to work, another 1000l. to clothe the boys in Heriot's Hospital, and the third 1000l. to bursars at the university.

About the beginning of this century John Strachan left his estate of Craigmook, now upwards of 300l. a-year, in trust to the presbytery of Edinburgh, to be by them disposed of in small annual sums to poor old people not under 65 years of age, and to orphans not above 12.

There is besides a society for the support of the indigent poor, another for the indigent sick, and there are also many charity-schools.

Having thus given an account of the most remarkable edifices belonging to Old Edinburgh, we shall now proceed to those of the New Town. This is terminated on the east side by the Calton-hill, round which there is a pleasant walk, and which affords one of the finest prospects that can be imagined,

varying

Edinburgh varying remarkably almost at every step. On this hill is a burying-ground, which contains a fine monument to the memory of David Hume the historian.—On the top is an Observatory, the scheme for building which was first adopted in the year 1736; but the disturbance occasioned by the Porteous mob prevented any thing from being done towards the execution of it at that time. The Earl of Morton afterwards gave 100 l. for the purpose of building an observatory, and appointed Mr M'Laurin professor of mathematics, together with the principal and some professors of the university, trustees for managing the sum. Mr M'Laurin added to the money above mentioned the profits arising from a course of lectures which he read on experimental philosophy; which, with some other small sums, amounted in all to 300 l.: but Mr M'Laurin dying, the design was dropped.—Afterwards the money was put into the hands of two persons who became bankrupt; but a considerable dividend being obtained out of their effects, the principal and interest, about the year 1776, amounted to 400 l. A plan of the building was made out by Mr Craig architect; and the foundation-stone was laid by Mr Stodart, lord provost of Edinburgh, on the 25th of August 1776. About this time, however, Mr Adam architect happening to come to Edinburgh, conceived the idea of giving the whole the appearance of a fortification, for which its situation on the top of the Calton-hill was very much adapted. Accordingly a line was marked out for inclosing the limits of the observatory with a wall constructed with buttresses and embrasures, and, having Gothic towers at the angles. Thus the money designed for the work was totally exhausted, and the observatory still remains unfinished; nor is there any appearance of its being soon completed either by voluntary subscription or any other way.

23. Proceeding to the westward, the first remarkable building is the *Theatre*, which stands opposite to the Register Office, in the middle of Shakespeare Square. The building is plain on the outside, but elegantly fitted up within, and is generally open three days in the week, and when full will draw about 150 l. a-night; so that the manager generally finds himself well rewarded when he can procure good actors.

Entertainments of the dramatic kind came very early into fashion in this country. They were at first only representations of religious subjects, and peculiarly designed to advance the interests of religion; the clergy being the composers, and Sunday the principal time of exhibition. In the 16th century, the number of play-houses was so great, that it was complained of as a nuisance, not only in Edinburgh, but throughout the kingdom. They soon degenerated from their original institution; and the plays, instead of being calculated to inspire devotion, became filled with all manner of buffoonery and indecency.—After the Reformation, the Presbyterian clergy complained of these indecencies; and being actuated by a spirit of violent zeal, anathematized every kind of theatrical representation whatever. King James VI. compelled them to pass from their censures against the stage; but in the time of Charles I. when fanaticism was carried to the utmost length, at which perhaps it was possible for it to arrive, it cannot be supposed that stage plays would be tolera-

ted.—It seems, however, that amusements of this kind were again introduced at Edinburgh about the year 1684, when the Duke of York kept his court there. His residence at Edinburgh drew off one half of the London company, and plays were acted in Edinburgh for some little time. The misfortunes attending the Duke of York, however, and the establishment of the Presbyterian religion (the genius of which is unfavourable to amusements of this kind), soon put a stop to the progress of the stage, and no theatrical exhibition was heard of in Edinburgh till after the year 1715. The first adventurer was Signora Violante, an Italian, remarkable for feats of strength, tumbling, &c. In this way the first exhibited in a house at the foot of Carrubber's Close, which has since been employed by different sectaries for religious purposes. Meeting with good success, she soon invited a company of comedians from London; and these being also well received, Edinburgh continued for some years to be entertained with the performances of a strolling company, who visited it annually. Becoming at last, however, obnoxious to the clergy, they were in 1727 prohibited by the magistrates from acting within their jurisdiction. But this interdict was suspended by the Court of Session, and the players continued to perform as usual.

Still, however, theatrical entertainments were but rare. The town was visited by itinerant companies only once in two or three years. They performed in the Taylor's Hall in the Cowgate; which, when the house was full, would have drawn (at the rate of 2s. 6d. for pit and boxes, and 1s. 6d. for the gallery) 40l. or 45 l. a-night. About this time an act of parliament was passed, prohibiting the exhibition of plays, except in a house licensed by the king. Of this the presbytery of Edinburgh immediately laid hold; and at their own expence brought an action on the statute against the players. The cause was by the Court of Session decided against the players; who thereupon applied to parliament for a bill to enable his majesty to license a theatre in Edinburgh. Against this bill petitions were presented in 1739 to the house of commons by the magistrates and town-council, the principal and professors of the university, and the dean of guild and his council; in consequence of which, the affair was dropped. All this opposition, however, contributed in reality to the success of the players; for the spirit of party being excited, a way of evading the act was easily found out, and the house was frequented more than usual, inasmuch that Taylor's Hall was found insufficient to contain the number of spectators.

The comedians now fell out among themselves, and a new playhouse was erected in the Canongate in the year 1746. The consequence of this was, that the old one in Taylor's Hall became entirely deserted, and through bad conduct the managers of the new theatre soon found themselves greatly involved. At last, a riot ensuing through dissensions among the performers, the playhouse was totally demolished.—When the extension of the royalty over the spot where the New Town is built was obtained, a clause was likewise added to the bill, enabling his majesty to license a theatre in Edinburgh. This was obtained, and thus the opposition of the clergy for ever silenced. But notwithstanding this,

Edinburgh. this, the high price paid by the managers to the patentee, being no less than 500 guineas annually, prevented them effectually from decorating the house as they would otherwise have done, or even from always retaining good actors in their service; by which means the success of the Edinburgh theatre has not been so great as might have been expected.

Not far from this building, an amphitheatre was opened in 1790, on the road to Leith, for equestrian exhibitions, pantomime entertainments, dancing, and tumbling. The circus is 60 feet diameter; and in the forenoon ladies and gentlemen are taught to ride. The house will hold about 1500 people.

24. *The Register Office.* This work was first suggested by the late Earl of Morton, lord-register of Scotland, with a view to prevent the danger which attended the usual method of keeping the public records. In former times, indeed, they suffered from a variety of accidents. Edward I. carried off or destroyed most of them, in order to prevent any marks of the former independency of the nation from remaining to posterity. Afterwards Cromwell spoiled this nation of its records, most of which were sent to the tower of London. At the time of the Restoration, many of them were sent down again by sea; but one of the vessels was shipwrecked, and the records brought by the other have ever since been left in the greatest confusion.—The Earl of Morton taking this into consideration, obtained from his majesty a grant of 12,000*l.* out of the forfeited estates, for the purpose of building a register-office, or house for keeping the records, and disposing them in proper order. The foundation was laid on the 27th of June 1774, by Lord Frederic Campbell lord-register, Mr Montgomery of Stanhope lord advocate, and Mr Miller of Barksimming lord justice-clerk; three of the trustees appointed by his majesty for executing the work. The ceremony was performed under a discharge of artillery, in presence of the judges of the courts of session and exchequer, and in the sight of a multitude of spectators. A brass plate was put into the foundation-stone with the following inscription: CONSERVANDIS TABULIS PUBLICIS POSITUM EST, ANNO M.DCC.LXXIV, MUNIFICENTIA OPTIMI ET PIETISSIMI PRINCIPIS GEORGH TERTII. In a glass vase hermetically sealed, which is also placed in the foundation-stone, are deposited specimens of the different coins of his present majesty.

The front of the building directly faces the bridge, extends from east to west 200 feet, and is 40 feet back from the line of Prince's-street. In the middle of the front is a small projection of three windows in breadth. Here is a pediment, having in its centre the arms of Great Britain, and the whole is supported by four Corinthian pilasters. At each end is a tower projecting beyond the rest of the building, having a Venetian window in front, and a cupola on the top. The front is ornamented from end to end with a beautiful Corinthian entablature. In the centre of the building is a dome of wooden work covered with lead. The inside forms a saloon 50 feet diameter and 80 high, lighted at top by a copper window 15 feet in diameter. Round the whole is a hanging gallery of stone, with an iron balustrade, which affords convenience for presses in the walls for keeping the records. The whole number of apartments is 97; all of which are vaulted beneath,

and warmed with fire-places. This building, which is the most beautiful of Mr Adams's designs, has been executed in a substantial manner, in about 16 years, at the expence of near 40,000*l.* and is one of the principal ornaments of the city. A serjeant's guard is placed here from the castle, for the further protection of the records. It is intended to place a statue of his present Majesty in the front of the building, with the lion and unicorn above the centinels boxes. The lord-register has the direction of the whole, and the principal clerks of Session are his deputies. These have a great number of clerks under them for carrying on the business of the Court of Session. The lord-register is a minister of state in this country. He formerly collected the votes of the parliament of Scotland, and still collects those of the peers at the election of 16 to represent them in parliament.

25. On the east side of St Andrew's Square stands the *General Excise Office*, built by the late Sir Laurence Dundas for his own residence, but sold by his son for the above purpose. It is a very handsome building, with a pediment in front ornamented with the king's arms, and supported by four Corinthian pilasters; and, in conjunction with the two corner houses, has a fine effect.

26. *St Andrew's Church* stands on the north side of George's Street. It is of an oval form; and has a very neat spire of 186 feet in height, with a chime of eight bells, the first and only one of the kind in Scotland. It has also a handsome portico in front.

27. Opposite to St Andrew's church is the *Physicians Hall*, designed for the meetings of the faculty, and which has a portico resembling that of the church.

28. Farther to the westward, on the south side, stand the *Assembly-rooms*, which though a heavy looking building on the outside, are nevertheless extremely elegant and commodious within. The largest is 100 feet long and 40 broad, being exceeded in its dimensions by none in the island, the large one at Bath excepted. Weekly assemblies are held here for dancing and card-playing, under the direction of a master of ceremonies; admission-tickets five shillings each.

It now remains only to speak something of the religious and civil establishments of this metropolis. ²⁹ The highest of the former is the General Assembly of the Church of Scotland, who meet here annually in the month of May, in an aisle of the church of St Giles fitted up for purpose for them. The throne is filled by a commissioner from his majesty, but he neither debates nor votes. He calls them together, and dissolves them at the appointed time in the name of the king; but they call and dissolve themselves in the name of the Lord Jesus Christ. This assembly consists of 350 members chosen out of the various presbyteries throughout the kingdom; and the debates are often very interesting and eloquent. This is the supreme ecclesiastical court in Scotland, to which appeals lie from the inferior ones.

The ecclesiastical court next in dignity to the assembly is the Synod of Lothian and Tweeddale, who meet in the same place in April and November; and next to them is the Presbytery of Edinburgh. These meet on the last Wednesday of every month, and are trustees on the fund for ministers widows. They have

Edinburgh. a hall in Scott's clofe, where there is a good picture of Dr Webster by Martin, which was put up at the expence of the trustees, out of gratitude for the trouble he took in planning and fully eftablifhing the fund.

The Society for Propagating Chriftian Knowledge in the Highlands and Iflands of Scotland, was eftablifhed a body corporate by queen Anne in the year 1709, for the purpofe of erecting fchools to inftitute poor children in the principles of Chriftianity, as well as in reading and writing. The fociety have a hall in Warrifton's clofe where their bufinefs is tranfacted. From time to time they have received large contributions, which have always been very properly applied; and for much the fame purpofe his majefty gives 1000*l.* annually to the general afsembly of the church of Scotland, which is employed by a committee of their number for inftituting the poor Highlanders in the principles of the Chriftian religion.

The Earfe church at Edinburgh was built about 20 years ago by fubfcription for the fame laudable purpofe. Great numbers of people refort to the metropolis from the Highlands, who underftand no other language but their own, and confequently have no opportunity of inftitution without it; and a moft remarkable proof of the benefit they have received from it is, that though the church is capable of holding 1000 people, yet it is not large enough for thofe who apply for feats. The minifter has 100*l.* *per annum* arifing from the feat-rents, and holds communion with the church of Scotland. The eftablifhment was promoted by William Dickfon dyer in Edinburgh.

30
Political
conftitu-
tion.

With regard to the political conftitution of Edinburgh, the town-council have the direction of all public affairs. The ordinary council confifts only of 25 perfons; but the *council ordinary and extraordinary*, of 33. The whole is compofed of merchants and traders, whofe refpective powers and interefts are fo interwoven, that a balance is preferved between the two bodies. The members of the town-council are partly elected by the members of the 14 incorporations, and they partly chofe their own fucceffors. The election is made in the following manner: Firft a lift or *let* of fix perfons is made out by each incorporation; from which number, the deacon belonging to that incorporation muft be chofen. Thefe lifts are then laid before the ordinary council of 25, who "fhorten the *lets*," by expunging one half of the names from each; and from the three remaining ones the deacon is to be chofen. When this election is over, the new deacons are prefented to the ordinary council, who chofe fix of them to be members of their body, and the fix deacons of laft year then walk off. The council of 25 next proceed to the election of three merchant and two trades counfellors. The members of council, who now amount to 33 in number, then make out *lets*, from which the lord provoft, dean of guild, treafurer, and bailies muft be chofen. The candidates for each of thefe offices are three in number; and the election is made by the 30 members of council already mentioned, joined to the eight extraordinary council-deacons.

The lord provoft of Edinburgh, who is ftiled *right honourable*, is high fheriff, coroner, and admiral, within the city and liberties, and the town, harbour, and road of Leith. He has alfo a jurifdiction in matters of life
N^o 108.

and death. He is prefes of the convention of royal Edinburgh boroughs, colonel of the trained bands, commander of the city-guard and of Edinburgh jail. In the city he has the precedence of all the great officers of ftate and of the nobility; walking on the right hand of the king or of his majefty's commiffioner; and has the privilege of having a fword and mace carried before him. Under him are four magiftrates called *bailies*, whofe office is much the fame with that of aldermen in London. There is alfo a dean of guild, who has the charge of the public buildings, and without whofe warrant no houfe nor building can be erected within the city. He has a council to confult with, a nominal treafurer, who formerly had the keeping of the town's money, which is now given to the clamberlain. Thefe feven are elected annually; who with the feven of the former year, three merchants and two trades counfellors, and 14 deacons or prefes of incorporated trades, making in all 33, form the council of the city, and have the fole management and difpofal of the city revenues; by which means they have the difpofal of places to the amount of 20,000*l.* annually. Formerly the provoft was alfo an officer in the Scots parliament. The magiftrates are fheriffs-depute and juftices of the peace; and the town council are alfo patrons of all the churches in Edinburgh, patrons of the univerfity, and electors of the city's reprefentative in parliament. They have befides a very ample jurifdiction both civil and criminal. They are fuperiors of the Canonage, Portburgh, and Leith; and appoint over thefe certain of their own number, who are called *baron bailies*: but the perfon who prefides over Leith has the title of *admiral*, becaufe he hath there a jurifdiction over maritime affairs. The baron bailies appoint one or two of the inhabitants of their refpective diftricts to be their fubftitutes, and thefe are called *refident bailies*. They hold courts in abfence of the baron-bailies, for petty offences, and difcuffing civil caufes of little moment.

No city in the world affords greater fecurity to the inhabitants in their perfons and properties than Edinburgh. Robberies are here very rare, and a ftreet-murder hardly known in the memory of man; fo that a perfon may walk the ftreets at any hour of the night in perfect fecurity. This is in a great meafure owing to the *town-guard*. This inftitution originated from the conftant ftation into which the citizens were thrown after the battle at Flodden. At that time, the town-council commanded the inhabitants to afsemble in defence of the city, and every fourth man to be on duty each night. This introduced a kind of perfonal duty for the defence of the town, called *watching and warding*; by which the trading part of the inhabitants were obliged in perfon to watch alternately, in order to prevent or fupprefs occafional difturbances. This, however, becoming in time extremely inconvenient, the town-council, in 1648, appointed a body of 60 men to be raifed; the captain of which was to have a monthly pay of 11*l.* 2*s.* 3*d.* two lieutenants of 2*l.* each, two ferjeants of 1*l.* 5*s.* and the private men of 1*s.* each. No regular fund was eftablifhed for defraying this expence; the confequence of which was, that the old method of watching and warding was refumed; but the people on whom this fervice devolved were now become fo relaxed in their difcipline, that the magiftrates were threatened with having the king's troops
5

Edinburgh. troops quartered in the city if they did not appoint a sufficient guard. On this 40 men were raised in 1679, and in 1682 the number was increased to 108. After the revolution, the town-council complained of the guard as a grievance, and requested parliament that it might be removed. Their request was immediately granted, and the old method of watching and warding was renewed. This, however, was now so intolerable, that the very next year they applied to parliament for leave to raise 126 men for the defence of the city, and to tax the citizens for their payment. This being granted, the corps was raised which still continues under the name of the *town-guard*. At present the establishment consists of three officers and about 90 men, who mount guard by turns. The officers have a lieutenant's pay; the sergeants, corporals, drummers, and common soldiers, the same with those of the army. Their arms are the same with those of the king's forces; but when called upon to quell mobs, they use Lochaber-axes, a part of the ancient Scottish armour now in use only among themselves.

32
Militia of
trained
bands.

The militia or trained band of the city consist of 16 companies of 100 men each. They were in use to turn out every king's birth-day; but only the officers now remain, who are chosen annually. They consist of 16 captains and as many lieutenants; the provost, as has already been mentioned, being the colonel.

The town-guard are paid chiefly by a tax on the trading people; these being the only persons formerly subject to watching and warding. This tax, however, amounts only to 1250*l.* and as the expence of the guard amounts to 1400*l.* the magistrates are obliged to defray the additional charge by other means.

33
Number of
inhabitants.

The number of inhabitants in the city of Edinburgh is somewhat uncertain, and has been very variously calculated. By a survey made in the year 1775, it appears that the number of families in the city, Canongate, and other suburbs, and the town of Leith, amounted to 13,806. The difficulty therefore is to fix the number of persons in a family. Dr Price fixes this number at $4\frac{1}{3}$; Mr Maitland, at $5\frac{1}{2}$; and Mr Arnot, at 6: so that, according to this last gentleman, the whole number of inhabitants is 82,836; to which he thinks 1400 more may be added for those in the garri-son, hospitals, &c. There are in Edinburgh 14 incorporations, capable of choosing their own deacons, viz. The royal college of surgeons; the corporations of goldsmiths, skimmers, furriers, hammermen, wrights and masons, tailors, bakers, butchers, shoemakers, weavers, waukers, bonnet-makers, and merchant-company. The revenue of the city, arising partly from duties of different kinds, and partly from landed property, is estimated at about 10,000*l.* per annum.

34
Plenty of
provisions.

The markets of Edinburgh are plentifully supplied with all sorts of provisions. Fresh butcher-meat, as well as fowl and fish, if the weather permit, may be had every day; and no city can be better supplied with garden stuffs. The Edinburgh strawberries particularly are remarkably large and fine. A remarkable instance of the plenty of provisions with which Edinburgh is supplied was observed in the year 1779, when several large fleets, all of them in want of necessities, arrived in the Forth, to the amount of

about 500 sail, and having on board at least 20,000 men; yet the increased consumption of provisions, which certainly ensued upon the arrival of so many strangers, made not the least increase in the rate of the markets, inasmuch that several victualling ships sent down by the navy-board returned without opening their hatches. The city-mills are let to the corporation of bakers in Edinburgh; and the bread made in the city is remarkable for its goodness.

Edinburgh
||
Edom.

Edinburgh is supplied with water brought for some miles in pipes, and lodged in two reservoirs, from whence it is distributed through the city both to public wells and private families. A revenue accrues to the town from the latter, which must undoubtedly increase in proportion as the city extends in magnitude.

There are but few merchants in Edinburgh, most of them residing at the port of Leith; so that the support of the city depends on the consumption of the necessaries as well as the superfluities of life. There are five different sorts of people on whom the shopkeepers, publicans, and different trades depend: 1. The people of the law, who are a very respectable body in the city. 2. The number of young people of both sexes who come to town for their education, many of the parents of whom come along with them. 3. The country gentlemen, gentlemen of the army and navy, and people who have made their fortunes abroad, &c. all of whom come to attend the public diversions, or to spend their time in such a manner as is most agreeable to them. 4. The vast concourse of travellers from all parts. 5. Most of the money drawn for the rents of country gentlemen is circulated among the bankers or other agents.

At Edinburgh there are excellent manufactures of linen and cambrics; there are also manufactures of paper in the neighbourhood, and printing is carried on very extensively. But for some time the capital branch about Edinburgh has been building; which has gone on, and still continues to do so, with such rapidity, that the city has been increased exceedingly in its extent; and it is not uncommon to see a house built in a few months, and even inhabited before the roof is quite finished.

EDITOR, a person of learning, who has the care of an impression of any work, particularly that of an ancient author: thus, Erasmus was a great editor; the Louvain doctors, Scaliger, Petavius, F. Simond, bishop Walton, Mr Hearne, Mr Ruddiman, &c. are likewise famous editors.

EDOM, or ESAY, the son of Isaac and brother of Jacob. The name of Edom, which signifies *red*, was given him, either because he sold his birth-right to Jacob for a mess of red pottage, or by reason of the colour of his hair and complexion. Idumæa derives its name from Edom, and is often called in scripture the land of Edom. See the next article.

EDOM, or IDUMÆA (anc. geog.), a district of Arabia Petrea; a great part also of the south of Judæa was called Idumæa, because occupied by the Idumæans, upon the Jewish captivity, quite to Hebron. But the proper Edom or Idumæa appears not to have been very extensive, from the march of the Israelites, in which they compassed it on the south eastwards, till

S s they

Edmund,
Education.

they came to the country of the Moabites. Within this compass lies mount Hor, where Aaron died; marching from which the Israelites fought with king Arad the Canaanite, who came down the wilderness against them (Moses). And this is the extent of the *Idumea Propria*, lying to the south of the Dead Sea; but in Solomon's time extending to the Red Sea (1 Kings ix. 26.)

EDMUND I. and II. See (*History of*) ENGLAND.

1
Definition.

EDUCATION may be defined, that series of means by which the human understanding is gradually enlightened, and the dispositions of the human heart are formed and called forth between earliest infancy and the period when we consider ourselves as qualified to take a part in active life, and, ceasing to direct our views solely to the acquisition of new knowledge or the formation of new habits, are content to act upon the principles which we have already acquired.

2
Particulars
compre-
hended un-
der the de-
finition.

This comprehends the circumstances of the child in regard to local situation, and the manner in which the necessities and conveniences of life are supplied to him; the degree of care and tenderness with which he is nursed in infancy; the examples set before him by parents, preceptors, and companions; the degree of restraint or licentiousness to which he is accustomed; the various bodily exercises, languages, arts, and sciences, which are taught him, and the method and order in which they are communicated; the moral and religious principles which are instilled into his mind; and even the state of health which he enjoys during that period of life.

3
Various
modes of
education
have pre-
vailed.

In different periods of society, in different climates, and under different forms of government, various institutions have naturally prevailed in the education of youth; and even in every different family, the children are educated in a different manner, according to the differences in the situation, dispositions, and abilities, of the parents. The education of youth being an object of the highest importance, has not only engaged the anxious care of parents, but has likewise often attracted the notice of the legislator and the philosopher. What our readers have therefore a right to expect from us on this article is, 1st, That we give an account of some of the most remarkable institutions for the education of youth which have been legally established or have accidentally prevailed among various nations and in various periods of society. 2^{dly}, That we also give some account of the most judicious and the most fanciful plans which have been proposed by those authors who have written on the subject of education. And, lastly, that we venture to present them with the result of our own observations and recollections on this important head.

4
Plan.

5.
Education
in a savage
state.

In the infancy of society, very little attention can be paid to the education of youth. Before men have risen above a savage state, they are almost entirely the creatures of appetite and instinct. The impulse of appetite hurries them to propagate their species. The power of instinctive affection is often, though not always, so strong as to compel them to preserve and nurse the fruit of their embraces. But even when their wants are not so urgent, nor their hearts so destitute of feeling, as to prompt them to abandon their new-born infants to the ferocity of wild beasts or the severity of the elements, yet still their uncomfortable

and precarious situation, their ignorance of the laws of Education, nature, their deficiency of moral and religious principles, and their want of dexterity or skill in any of the arts of life, all these together must render them unable to regulate the education of their children with much attention or sagacity. They may relate to them the wild inconsistent tales in which all their notions concerning superior beings and all their knowledge of the circumstances and transactions of their ancestors are contained; they may teach them to bend the bow, to point their arrows, to hollow the trunk of a tree into a canoe, and to trace the almost imperceptible path of an enemy or a wild beast over dreary mountains or through intricate forests: but they cannot impress their minds with just ideas concerning their social relations, or concerning their obligations to a Supreme Being, the framer and upholder of nature: they teach them not to repress their irregular appetites, nor to restrain the sallies of passion when they exceed just bounds or are improperly directed; nor can they inform their understandings with very accurate or extensive views of the phenomena of nature. Besides, they know not how far implicit obedience to his parents commands is to be required of the boy or youth, nor how far he ought to be left to the guidance of his own reason or humour. Among savages the influence of parental authority soon expires, nor is the parent solicitous to maintain it. As the eagle expels his young from his lofty nest as soon as they become able to support themselves in the air; so the savage generally ceases to care for his child, or assume any power over him, as soon as he becomes capable of procuring the means necessary for his own subsistence. Savages being scarce connected by any social ties, being unacquainted with the restraint of civil laws, and being unable to contribute in any great degree to the maintenance or protection of one another; each individual among them, as soon as he attains that degree of strength and dexterity which may enable him to procure the necessities of life, stands single and alone, independent on others, and scornful to submit to their commands. The parent, conscious of his inability to confer any important benefits on his child, after he has advanced even a very short way towards manhood, no longer endeavours to controul his actions; and the child, proud of his independence, scarce submits to ask his parent's advice. And even before reaching this period of independence, so few are the benefits which parents can bestow (being confined to supplying the necessities of life, and communicating the knowledge of a very few of the rudest simplest arts), that children regard them with little deference, nor do they always insist on implicit submission. Want of natural affection, and consciousness of superior strength, often prompt the parent to abuse the weakness of his child. Yet though small the skill with which the savage can cultivate the understanding or form the dispositions of his child, though few the arts which he can teach him, and though not very respectful or submissive the obedience or deference which he requires; yet is there one quality of mind which the savage is more careful to inspire than those parents who are directed in educating their children by all the lights of civilized society. That quality is indeed absolutely necessary to fit the savage for his situation; without it, the day on which he ceased

Education

Education

ceased to enjoy the protection of his parents would most probably be the last day of his life: That quality is Fortitude. We may perhaps think, that the hardships to which the young savage is from the period of his birth unavoidably exposed, might be enough to inspire him with fortitude; but, as if these were insufficient, other means are applied to inspire him with what the Stoics have regarded as the first of virtues. He is compelled to submit to many hardships unnecessary, but from a view to this. Children are there called to emulate each other in bearing the severest torments. Charlevoix relates, that he has seen a boy and girl bind their arms together, place a burning coal between them, and try who could longest endure without shrinking the pain to which they thus exposed themselves.

6
The savage
inherited
chiefly to
nature and
circumstances
for his
education.

Still, however, the young savage owes his education rather to nature and to the circumstances in which he is placed, and the accidents which befall him, than to the kindness or prudence of his parents. Nature has endowed him with certain powers of understanding, sentiments, sensations, and bodily organs; he has been placed in certain circumstances, and is exposed to a certain train of events; and by these means chiefly, not by the watchful industry of instructors, does he become such as he appears when he has reached the years of maturity.

7
Education
in an im-
proved state
of society.

But man was not designed by his wife and beneficent Creator to remain long in a savage state; the principles of his nature incline him to social life. Reason, distinguishing the superior advantages to be enjoyed in society, concurs with the social principle in his breast, in prompting him to seek the company and conversation of others of the human race. When men enter into society, they always unite their powers and talents, in a certain degree, for the common advantage of the social body. In consequence of this, laws come in time to be instituted; new arts are invented; progress is made in the knowledge of nature; moral duties are better understood and defined; juster ideas are gradually acquired of all our social relations; friendship, love, filial, parental, and conjugal affection, all are heightened and refined. All these advantages do not instantly result from men's entering into a social state; the improvement of the human mind, and the civilization of society, are gradual and progressive: But as it is natural for men to unite in a social state, so it is no less natural for society to be gradually improved and civilized till it attain an high degree of perfection and refinement.

8
Attention
to the edu-
cation of
youth a na-
tural con-
sequence of
civiliza-
tion.

When men have attained to such knowledge and improvement as to be intitled to a more honourable appellation than that of savages, one part of their improvements generally consists in their becoming more judicious and attentive in directing the education of their youth. They have now acquired ideas of dependence and subordination; they have arts to teach and knowledge to communicate; they have moral principles to instil; and have formed notions of their relation and obligations to superior powers, which they are desirous that their children should also entertain. Their affection to their offspring is now also more tender and constant. We observe at present in that state of society in which we live, that the poor who can scarce earn for themselves and their children the ne-

cessaries of life, are generally less susceptible of parental affection, in all its anxious tenderness, than the rich, or those whom Providence hath placed in easy circumstances; and we may make use of this fact in reasoning concerning the different degrees of the same affection felt by the savage and the member of a civilized society. The savage may be considered as the poor man, who with difficulty procures the necessities of life even for himself; the other, as the man in affluent circumstances, who is more at leisure to listen to the voice of tender and generous affection.

In this improved state of society, the education of youth is viewed as an object of higher importance. The child is dearer to his parent; and the parent is now more capable of cultivating the understanding and rectifying the dispositions of his child. His knowledge of nature, and his dexterity in the arts of life, give him more authority over a child than what the savage can possess. Obedience is now enforced, and a system of education is adopted; by means of which the parent attempts to form his child for acting a part in social life. Perhaps the legislature interferes; the education of the youth is regarded as highly worthy of public concern; it is considered that the foolish fondness or the unnatural caprice of parents may, in the rising generation, blast the hopes of the state.

In reviewing ancient history, we find that this actually took place in several of the most celebrated governments of antiquity. The Persians, the Cretans, and the Lacedaemonians, were all of them too anxious to form their youth for discharging the duties of citizens to entrust the education of the children solely to the parents. Public establishments were formed among those nations, and a series of institutions enacted, for carrying on and regulating the education of their youths: Not such as our European universities, in which literary knowledge is the sole object of pursuit, the student is maintained solely at his parents expence, and attends only if his parents think proper to send him; but of a very different nature, and on a much more enlarged plan.

The Persians, according to the elegant and accurate account delivered by Xenophon in the beginning of his Cyropædia, divided the whole body of their citizens into four orders; the boys, the youth, the full-grown men, and those who were advanced beyond that period of life during which military service was required. For each of these orders particular halls were appropriated. Each of them was subjected to the inspection of twelve rulers. The adults and the superannuated were required to employ themselves in the performance of particular duties, suitable to their age, their abilities, and their experience; while the boys and the youth were engaged in such a course of education as seemed likely to render them worthy and useful citizens.

The boys were not employed, in their places of instruction, in acquiring literary accomplishments; for to such the Persians were strangers. They went thither to learn justice, temperance, modesty, to shoot the bow, and to lanch the javelin. The virtues and the bodily exercises were what the Persians laboured to teach their children. These were the direct, and not subordinate, purposes of their system of education. The masters used to spend the greatest part of the day in

9
Public es-
tablish-
ments for
education
among the
ancients.

10
Among the
ancient
Persians.

Educator.

dispensing justice to their scholars; who carried before them actions for thefts, robberies, frauds, and other such grounds of complaint against one another.—Such were the means by which the Persians endeavoured to instil, even in early youth, a regard for the laws of natural equity, and for the institutions of their country. Till the age of 16 or 17, the boys were busied in acquiring those parts of education. At that period they ceased to be considered as boys, and were raised to the order of the youths. After they entered this order, the same views were still attended to in the carrying on of their education. They were still enured to bodily labour. They were to attend the magistrates, and to be always ready to execute their commands. They were led out frequently to the chase; and on such expeditions they were always headed by the king, as in time of war. Here they were taught to expose themselves fearlessly to danger; to suffer, without repining or complaint, hunger, thirst, and fatigue; and to content themselves with the coarsest, simplest fare, for relieving the necessities of nature. In short, whether at home or out on some hunting expedition, they were constantly employed in acquiring new skill and dexterity in military exercises, new vigour of mind and body, and confirmed habits of temperance, fortitude, abstinence, patience, patriotism, and noble integrity. After spending ten years in this manner, their course of education was completed; they were admitted into the class of the adults, and were esteemed qualified for public offices. It must not escape our notice, that the citizens were not compelled to send their children to pass through this course of education in the public halls; but none except such as passed through this course of education were capable of civil power, or admitted to participate in public offices or public honours.

Such are the outlines of that system of education which Xenophon represents as publicly established among the Persians. Were we able to preserve in a translation all the manly and graceful simplicity of that enchanting author, we would have offered to the perusal of our readers the passage in which he has described it; but conscious of being inadequate to that task, we have presumed only to extract the information which it contains.

Perhaps, however, this system of education did not subsist precisely as the eloquent disciple of Socrates describes it among that rude and simple people. On other occasions he has commemorated such instances of their barbarity, as would tempt us to think them incapable of so much order and so much wisdom. Perhaps, as the discoverers of the new world have sometimes conferred on the inhabitants of that hemisphere, in the accounts of them with which they entertained their friends in Europe, amazing degrees of moral and political wisdom, of skill and dexterity in the arts, of industry and valour, which those uncivilized children of nature were afterwards found not to possess; so the Athenian philosopher has also ascribed to the Persians prudence and attention in regulating the education of their youth beyond what people in so rude a state can possibly exert.

But if we examine into the principles on which this system of education proceeds, without concerning ourselves whether it once actually prevailed among the

Persians, or is the production of the fine imagination of Xenophon, we will find it peculiarly suitable for a nation just emerging from the rudeness and ignorance of barbarity to a knowledge of social and civil relations, and of the duties connected with such relations. They have sacrificed their independence to obtain the comfort and security of a social state. They now glory in the appellation of citizens, and are desirous to discharge the duties incumbent on a citizen. They must inform their children in the nature of their social relations, and impress them with habits of discharging their social duties; otherwise the society will soon be dissolved, and their posterity will fall back into the same wild miserable state from which they have emerged. But perhaps the circumstances, or abilities, or dispositions of individuals, render them unequal to this weighty task. It becomes therefore naturally an object of public care. The whole social body find it necessary to deliberate on the most proper means for discharging it aright. A plan of education is then formed; the great object of which is, to fit the youth for discharging the duties of citizens. Arts and sciences are hitherto almost wholly unknown; and all that can be communicated to the youth is only a skill in such exercises as are necessary for their procuring subsistence, or defending themselves against human enemies or beasts of prey; and habits of performing those duties, the neglect of which must be fatal to the society or the individual.

Such is the system of education which we have surveyed as established among the Persians; and perhaps we may now be less suspicious than before of Xenophon's veracity. It appears natural for a people who have reached that degree of civilization in which they are described, and have not yet advanced farther, to institute such an establishment. Some such establishment also appears necessary to prevent the society from falling back into their former barbarity. It will prevent their virtue and valour from decaying, though it may perhaps at the same time prevent them from making any very rapid progress in civilization and refinement. Yet the industry, the valour, the integrity, and the patriotism which it inspires, must necessarily produce some favourable change in their circumstances; and that change in their circumstances will be followed by a change in their system of education.

The Cretans, too, the wisdom of whose laws is so much celebrated in the records of antiquity, had a public establishment for the education of their youth. Minos, whom they revered as their great legislator, was also the founder of that establishment. Its tendency was similar to that of the course of education pursued among the Persians,—to form the soldier and the citizen. We cannot prevent our readers with a very particular or accurate account of it; but such as we have been able to procure from the best authorities we think it our duty to lay before them.

The Cretans were divided into three classes; the boys, the youth, and the adults. Between seven and seventeen years of age, the boy was employed in learning to shoot the bow, and in acquiring the knowledge of his duties as a man and a citizen, by listening to the conversation of the old men in the public halls, and observing their conduct. At the age of seven, he was conducted to the public halls to enter on this course

11
Remarks
on Xeno-
phor's ac-
count of
Persian
education.

12

Among the
Cretans.

Education. course of education. He was taught to expose himself boldly to danger and fatigue; to aspire after skill and dexterity in the use of arms and in the gymnastic exercises; to repeat the laws and hymns in honour of the gods. At the age of seventeen he was enrolled among the youth. Here his education was still continued on the same plan. He was to exercise himself among his equals in hunting, wrestling, and the military exercises; and while thus engaged, his spirits were roused and animated by strains of martial music played on such instruments as were then in use among the inhabitants of Crete. One part of the education of the Cretan youth, in which they were particularly desirous to excel, was the Pyrrhic dance; which was the invention of a Cretan, and consisted of various military evolutions performed to the sound of instruments.

Such were the principles and arts in which the Cretan legislature directed the youth to be instructed. This course of education could not be directed or superintended by the parent. It was public, and carried on with a view to fit the boy for discharging the duties of a citizen when he should attain to manhood.

^{T 3} **Remarks on the Cretan education.** It is easy to see, that such a system of education must have been instituted in the infancy of society, before many arts had been invented, or the distinctions of rank had arisen; at a time when men subsisted in a considerable degree by hunting, and when the intercourse of nations was on such a footing, that war, instead of being occasional, was the great business of life. Such a system of life would then naturally take place even though no sage legislator had arisen to regulate and enforce it.

^{T 4} **Among the Lacedæmonians.** Lycurgus, the celebrated lawgiver of Lacedæmon, thought it necessary to direct the education of youth in a particular manner, in order to prepare them for paying a strict obedience to his laws. He regarded children as belonging more properly to the state than to their parents, and wished that patriotism should be still more carefully cherished in their breasts than filial affection. The spirit of his system of education was pretty similar to that of those which we have just viewed as subsisting among the Persians and the Cretans.

As soon as a boy was born, he was submitted to the inspection of the elders of that tribe to which his parents belonged. If he was well shaped, strong, and vigorous, they directed him to be brought up, and assigned a certain portion of land for his maintenance. If he was deformed, weak, and sickly, they condemned him to be exposed, as not being likely ever to become an useful citizen. If the boy appeared worthy of being brought up, he was entrusted to the care of his parents till he attained the age of seven years; but his parents were strictly charged not to spoil either his mind or his bodily constitution by foolish tenderness. Probably, too, the state of their manners was at that time such as not to render the injunction peculiarly necessary.

At the age of seven, however, he was introduced to a public class, consisting of all the boys of the same age. Their education was committed to masters appointed by the state; and what was chiefly inculcated on them in the course of it, was submissive obedience and respect to their superiors; quickness and brevity in

their conversation, and replies to such questions as **Education.** were put to them; dexterity and address in performing what was commanded them, and firmness and patience in bearing every pain or hardship to which they might be exposed. One of the means used to form them to habits of activity and address, was to permit, nay, to direct them to commit little acts of theft; which, if they performed them so dexterously as to avoid detection, they might afterwards boast of as noble exploits; but if detected in such enterprises, the awkward artless boy was exposed both to punishment and disgrace. To avoid the punishment and disgrace incurred by being detected in an act of theft, the Spartan boy would often suffer with unshrinking fortitude the severest torments. It is related of one of them, that rather than be discovered with a young fox under his cloak, which he had stolen, he suffered the little animal to tear open his bowels. Not content with beholding the children suffer by submitting voluntarily to such hardships, the Spartans also endeavoured to form them to fortitude, by whipping them on their religious festivals, sometimes with such severity that they expired under the lash. The Lacedæmonian youth were also taught such bodily exercises, and the use of such warlike weapons, as were necessary to render them expert and skilful soldiers.

^{T 5} **Remarks.** They too, as well as the Cretans and Persians, among whom we have seen that somewhat similar modes of education prevailed, were to be citizens and soldiers; not husbandmen, mechanics, artists, merchants, &c. Therefore the mode of education established among them was simple and uniform. Its aim was, to make them acquainted with the nature of their social duties, and to form them to such vigour of body and such firmness of mind as might render them fit for the station in which they were to be placed, and adequate to the part which they were to act. This establishment for education was perfectly consistent with the other parts of that legislature which was instituted by Lycurgus. Youth educated among the Lacedæmonians could hardly fail to become worthy members of that singular republic. Let us not however regard the Spartans as singularly inhumane in their treatment of youth. Let us recast, in imagination, to that period in the progress of society from rudeness to refinement, to which they had attained when Lycurgus arose among them. What were then their circumstances, their arts and manners, their moral principles, and military discipline? Not very different from those which the laws of Lycurgus rendered so long stationary among them. He, no doubt, rectified some abuses, and introduced greater order and equality. But man is not to be so easily metamorphosed into a new form. As you cannot, at once, raise an acorn to a venerable oak; so neither will you be able to change the savage, at once, into the citizen. All the art or wisdom of Lycurgus, even though assisted by all the influence of the prophetic Apollo, could never have established his laws among his countrymen, had not their character and circumstances previously disposed them to receive them. But, grant this, and you must, of consequence, allow, that what to us may appear cruel and inhumane, must have affected their feelings in a different manner. The change introduced in the treatment of youth by the establishment

Education.

ment of this system of education was probably recommended by its being more humane than what before prevailed. Corrupted as are our manners, and effeminate our modes of education; yet we would not perhaps act wisely in laying them aside, to adopt in their stead those of ancient Sparta. But the Spartan education was peculiarly well fitted to form citizens for the republic of Lycurgus; it was happily adapted to that state of society in which it was introduced. And, if we should enquire by what means Lycurgus was enabled to fix the arts, the manners, and in short the civilization of his country, for so long a period in a stationary state; we would perhaps find reason to ascribe that effect, to the public establishment which he instituted for the education of youth; to his confining the Spartan citizens to the profession of arms, and assigning all servile offices to the Helots; and to his prohibiting the use of gold and silver. Among these however his establishment for education occupies the chief place. Never was any state adorned with more patriotic citizens than those of Sparta. With them every private affection seemed to be swallowed up by the *amor patriæ*: the love of their country was at least their ruling passion. Pædarctes being rejected when he offered himself a candidate for a seat among the council of three hundred, returned home, rejoicing that there were in Sparta no fewer than three hundred whom his countrymen found reason to regard as better citizens than himself. This was not a seeming joy, assumed to conceal the pain which he suffered from the disappointment; it was heartfelt and sincere. Such were the effects of their system of education.

16
Education among other nations of antiquity.

When we turn our eyes from the Persians, the Cretans, and the Spartans, to the other nations of antiquity; we no where behold so regular a system of public education. Among the Athenians and the Romans, the laws did not descend to regulate in so particular a manner the management of the youth. These nations gradually emerged from a state of the rudest barbarity, to that polished, enlightened, and civilized state which rendered them the glory and the wonder of the heathen world: but in no part of their progress from the one state to the other do we find any such establishment subsisting among them. So various, however, are the circumstances which form and diversify the character of nations, that we cannot reasonably conclude, because no such establishments existed among the Athenians and Romans, that therefore their existence was unnatural among those nations who possessed them. But though the education of youth was managed in a different manner among these and most other nations in the ancient world, than by public establishments, which detached children from the care of their parents; yet still it was every where regarded as an object of the highest importance. As the manners of mankind gradually improved to a state of refinement; as the invention of arts, and the discovery of science gradually introduced opulence and luxury; connubial, parental, and filial affection gradually acquired greater strength and tenderness. Of consequence, children experienced more of their parents care; and that care was directed to form them for acting a becoming part in life. According to the circumstances of each nation, the arts which they cultivated, and the form of government

under which they lived; the knowledge which they sought to communicate to their children, and the habits which they endeavoured to impress upon them, were different from those of other nations: And again, according to the different circumstances, tempers, abilities, and dispositions of parents, even the children of each family were brought up in a manner different from that in which those of other families were managed. The Athenians, the Romans, the Carthaginians, conducted each of them the education of their youth in a different manner, because they had each different objects in view. But having considered the most singular establishments for education which prevailed in the ancient world, it seems unnecessary for us to descend to a particular account of the manner which every nation, or fantastic individual, thought proper to pursue in bringing up their youth. It will probably be more useful and entertaining to our readers, if we next present them with a view of some of the most judicious or fanciful plans of education which have been proposed by the writers on that subject.

One of the most respectable writers on education among the ancients, is the celebrated Quintilian. He

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Quintilian.

taught rhetoric in Rome during the reign of Domitian and under several of the other emperors. When he retired from the exercise of his employment as a teacher of rhetoric, he spent his leisure in the composition of a treatise, not merely on rhetoric, but on the most proper means for educating a boy so as to render him both an eloquent orator and a good man. In that valuable treatise, he enters into a minute detail of all that appears to him most likely to conduce to those important ends.

As soon as the boy enters the world, he would have the greatest care to be used in selecting those who are to be placed about him. Let his nurse have no impediment of speech. It will be happy for him, if his parents be persons of sense and learning. Let his tutor, at least, possess these qualifications. As soon as he attains the distinct use of his organs of speech, let him be initiated in the first elements of literature. For as he is capable of distinguishing and remembering at a very early age; so his faculties cannot possibly be employed in a more advantageous manner. And even at this early period of life, let maxims of prudence and the first principles of morals be inculcated upon his mind by the books which are put into his hands, and even by the lines which he copies in learning the art of writing. The Greek language was to the Romans in the days of Quintilian, what the Latin and Greek and French are to us at present, an acquisition held indispensably necessary to those who aspired to a liberal education; and Quintilian judges it proper that the boy should begin his application to letters with the Greek language in preference to his mother tongue.

This judicious writer next examines a question which has been often agitated, Whether a domestic or a public education is liable to the fewest inconveniences, and likely to be attended with the greatest advantages? And he is of opinion, that in a domestic education the boy is in danger of being corrupted by injudicious fondness and evil example; is not roused by the spur of emulation; and is deprived of proper opportunities for acquiring a just idea of his own powers, or that

Education. activity and dexterity which he will afterwards find so necessary when he comes to act a part in life : While in a public education, which was preferred by some of the most renowned nations of antiquity, the morals are not greatly exposed to corruption, emulation is roused, friendships are formed, all the powers of the mind are called forth to act with new vigour, and the youth is prepared for performing his part on the great theatre of the world. Quintilian, therefore, wishes that parents would place their children in public seminaries of education.

When a boy is committed to a master's care, the master's attention must be first directed to discover his dispositions and the extent of his capacity. Of his capacity he will form a favourable judgment, not from his sprightliness, nor even from his quickness of apprehension ; but from his modesty, docility, and virtuous dispositions. If the boy possesses these last qualifications, the master will rejoice in him, as likely to give him satisfaction and do him honour. According to his temper and dispositions, let the boy be treated with mildness or severity ; but never let severity extend to blows. Let the boy be allured and led, by the most artful and insinuating treatment, to do his duty ; there will then be no occasion to punish him for neglecting it.

As Quintilian's professed object was, not merely to give general directions for forming the heart and cultivating the understanding, but to form a particular character in life, the scholar and the orator ; he finds it necessary to enter into minute details concerning the manner in which the boy is to be instructed in speaking, writing, grammar, and composition ; of which it does not appear necessary for us to take particular notice in this place. Music and geometry, he thinks, ought to make a part of the young orator's studies ; as being useful to render him accurate in reasoning, and capable of relishing the beauties of the poets. He is also of opinion, that the boy should not be confined to one branch of study, without being allowed to attempt others till he have made himself master of that. Let several parts of literature engage his attention by turns : let him dedicate a considerable portion of his time to them. He may thus acquire habits of industrious application which will remain with him through life.

With the tender attention of a good man, this sensible and elegant writer still accompanies his pupil through the course of his studies ; anxiously insists that he be placed under a master distinguished for purity of morals, and for no mean abilities in his profession ; directs his memory to be stored with the noblest passages of the poets, orators, and historians ; and carefully discusses and refutes those opinions which represent genius as above industry. The remaining part of his work being employed on the principles of rhetoric, without containing any thing on the subject of education in general, it is not necessary that we should here present an analysis of it to our readers. But since Quintilian was so distinguished, not only as a rhetorician, but as an instructor of youth, and displays so much good sense and so solid a judgment, formed on long experience, in whatever he advances on the subject of education ; we could not, without extreme negligence, omit taking notice of him under this ar-

ticle, and affording our readers an opportunity of Education, being instructed by listening to his sentiments on this head.

The name of John Milton is so much revered in Britain, that his sentiments on any subject are interesting to Britons. His life was dedicated to study : During a part of it, he was employed in the task of instructing youth ; and among his other works we find a treatise on education. He had himself been educated according to that plan which has long been established in the English universities ; but with that mode of education he was not satisfied. The object of his directions is chiefly to form the scholar. He considered himself as qualified to exhibit a model of "a better education, in extent and comprehension far more large, and yet of time far shorter, and of attainment far more certain, than any that had yet been in practice." The following is the substance of his treatise.

As the end of learning is to cultivate our understandings, and to rectify our dispositions ; therefore the design of our applying to the study of languages cannot be merely that we may commit to memory the words of which they consist, or that we may acquire a knowledge of their analogy and structure ; but that we may enrich our minds with the treasures of wisdom which they contain. But in the present modes of education this design does not appear to be kept in view. The learner of Latin is burdened with rules, and themes, and verses, and orations ; but no care is taken to make him master of the valuable knowledge which the classics contain. And when he advances a little farther, he is driven into the thorny paths of logic and metaphysics. So, when his studies are completed, and he is considered as having received a liberal education, he is almost as destitute of real knowledge as when he first entered a school.

But to render learning truly beneficial, instead of the school and university education which youth at present receive ; let the place of both school and university be supplied by an academy, in which they may acquire all that is taught at either, except law and physics. Let the academy afford accommodation for 150 persons ; 20 of whom may be servants and attendants. As many academies as are necessary may be afterwards erected on the model of this one. Let the youth who are introduced into this academy begin their studies with learning the principal rules of grammar from some good elementary book. In their pronunciation of Latin, let them be taught to follow the pronunciation of the Italians ; as that of the English is indistinct, and unsuitable to the genius of the language. Next, read to them some entertaining book on education ; such as, the three first books of Quintilian in Latin, and Cebes, Plutarch, or some other of the Socratic discourses, in Greek ; and be careful to seize every opportunity of inspiring them, by seasonable lectures and explanations, with love for learning, admiration of great and virtuous characters, and a disposition to cheerful obedience. At the same time, but at a different hour of the day, let them be instructed in the rules of arithmetic and the elements of geometry. Between supper and bed-time instruct them in the principles of religion and the sacred history. From the writers on education let your pupils pass to the authors on agriculture, to Cato, Varro, and Columella. Be-

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Milton's
treatise on
education.

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fore half these authors be read, they cannot but be pretty well qualified to read most of the prose authors in the Latin language; and they may now, with great propriety, learn the use of the globes, and make themselves acquainted with the ancient and modern maps. Let them, about the same time, begin the study of the Greek tongue, and proceed in it as in the Latin: they will not fail to overcome, in a short time, all the difficulties of grammar; after which they will have access to all the treasures of natural knowledge to be found in Aristotle and Theophrastus. In the same manner they may make themselves acquainted with Vitruvius, Seneca, Mela, Celsus, Pliny, and Solinus. And having thus passed through the principles of arithmetic, geometry, astronomy, and geography, with a general compact of physics; let them next turn their attention to mathematics, in which they may begin with the practical branch of trigonometry, which will serve as an introduction to fortification, architecture, and navigation. To teach them the knowledge of nature, and instruct them in the arts of life, let them have the assistance and instructions, not merely of masters who are acquainted only with books, but of men whose skill has been obtained by actual practice, even of artists and mechanics. Next, let the poets obtain their attention; and they will now read them with ease and pleasure. From the poets let your pupils proceed to the moralists; and, after acquainting themselves with them, they may be allowed the entertainment of some of the best Greek, Latin, and Italian, dramatic compositions. From these let them proceed to politics: let them here study the law of Moses, the admirable remains of the ancient lawgivers of Greece, the Roman tables, edicts, and pandects, concluding with the institutions of their mother country. Now let them be more particularly instructed in the principles of theology; for by this time they may have acquired the Hebrew language, together with the Chaldee and the Syriac dialect, and may therefore read the scriptures in their original language. When their minds are thus furnished, they will be able to enter into the spirit of the noblest historians and poets. To get by heart, and repeat in a proper manner, passages from the writings of some of these, will have the happiest effects in elevating their genius. Let this stately edifice be crowned with logic and rhetoric. Far different would be the effects of such a course of education, from those produced by any which is at present pursued. We should then see abler writers, more eloquent speakers, and wiser statesmen. Similar to this, probably, was the course taught in the famous schools of Pythagoras, Plato, Isocrates, and Aristotle. This would unite the advantages of an Athenian and a Spartan education: for our pupils should be taught the exercises of wrestling and fencing, and the whole military discipline.

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Remarks.

Such are the ideas of our admired Milton on the subject of education. An enthusiastic admirer of the sciences, arts, and institutions of Greece and Rome; from his religious and political principles, no friend to the universities; it was natural for a man of his learning and ingenuity, in an age of innovation, and influenced by such prejudices, to form such a project as that which we have surveyed. He seems not to have reflected, that it is necessary for children to be long oc-

cupied in obtaining a familiar acquaintance with Education. words, before they can gain from books any knowledge of things; overlooking this circumstance, and perceiving plainly that the mode of education which then prevailed confined the attention of youth almost wholly to words, he could not but regard the scheme which he proposed as likely to produce very happy effects. His observation, that the appearances of external nature are among the first objects which attract the attention of youth, which he communicates by directing his pupils to peruse the writers on agriculture and natural history as near the beginning of their studies as possible; if not altogether just, yet must be allowed to be nearly so. Perhaps human actions and passions, and the series of events which happen around us, are, by the time at which we begin our application to learning, the objects which most frequently and strongly engage our attention: But the appearances of external nature are at least the next object of our regard.

Mr Locke, to whose abilities and noble desire to be ²⁰Locke's useful to the world his country is so much indebted, Treatise on has written, among other things, on the education of education. youth. He was capable of thinking for himself; but more desirous of rendering himself useful, than of being admired for singularity. He is, therefore, an author to whom we ought to listen, at least, with respectful attention. If Quintilian and Milton had been employed as teachers of youth, Mr Locke had been conversant with the world, had inquired into the principles of human nature, and had no doubt endeavoured to examine without prejudice the effects of those modes of education of which he disapproves. When we consider, that, to render himself useful to the rising generation, he could descend from the heights of science to translate the fables of Æsop, and to perform other humble tasks in literature, which a philosopher of less benevolence and virtue would have disdain'd; we cannot but look with veneration and gratitude on so exalted a character. In his Treatise on Education, the two great objects which Mr Locke keeps in view are, 1st, To preserve and strengthen the bodily constitution; 2^{dly}, To inform the understanding with useful knowledge, and to cherish good dispositions in the heart.

In his directions on the first of these heads, he seems ²¹Bodily con- extremely anxious to prevent parents and others in situation. whose hands children are placed, from injuring them by ill-directed tenderness. Plain fare, simple and light clothing, abstinence from physic and from strong liquors, he earnestly recommends as the most judicious means for preserving and confirming the health of the child. In all his gratifications let the strictest moderation be observed. If you permit him to indulge pretty freely in sleep, at least cause him to get up at an early hour in the morning. In one thing, however, few parents will be willing to comply with Mr Locke's advice. He not only directs that the child's feet be frequently bathed in cold water; but even expresses a wish, that his shoes were always kept in such a condition as to admit water freely. This he thinks likely to fortify the constitution of the body in such a manner, as to render him less liable, in the course of life, to such diseases as arise from any unusual exposure to wetness or cold, than others whose feet

Education. feet have been more carefully kept dry. Though he had prosecuted his studies with a design to enter into the profession of physic, yet so unfavourable an opinion did he entertain of the effects produced by medical preparations on the human constitution, that he earnestly insists on the parent to beware of administering any of them to his child. From the desire which Mr Locke discovers to have children exposed to hardships, and restrained from indulgence, in order to confirm the health and invigorate the constitution, we may conjecture him to have been an admirer of that severe mode of education which usually prevails in the earlier periods of the existence of society. He seems to have thought, that if a boy be brought up like a Huron or a Spartan, he must necessarily become robust and healthy; without reflecting, that of those children who are subjected to such a course of education, too great a proportion are unable to surmount it: such is the natural delicacy of the human frame.

22 Cultivation of the powers of the mind. When he turns his attention to the cultivating of the understanding, and the forming of the dispositions, Mr Locke still deservedly claims the regard of the parent and the preceptor. With a virtuous indignation he reprobates that negligence and folly by which we generally corrupt the heart and spoil the temper of children, even in the period of infancy; so as to render them incorrigible when they advance farther in life. Their appetites are pampered, all their desires are gratified; and if we are at any time disposed to refuse what they ask, they have an all-powerful engine to compel our compliance with their wishes. They assail us with tears; and we then yield to their requests, however hurtful to themselves or inconvenient to us. We often studiously instruct them in vicious tricks, and call forth their evil passions. At so early an age, their rage or cunning can scarcely injure us; and we reflect not that habits of peevishness and deceit must be peculiarly hurtful to themselves.

But though all the foolish desires of children ought not to be gratified, and though we should carefully avoid leading them into any bad habit; yet it is not necessary nor prudent to treat them with harshness or severity. Let them be formed to obedience from their earliest years: let them be accustomed to submit implicitly to the direction of those on whom they depend. But beware of souring their temper and depressing their spirits by harshness: and on the other hand, remember, that it is no less improper to give the boy a habit of neglecting his duty except when he is allured to it by the hopes of reward. As he advances towards manhood, and attains the use of reason; you may admit him to greater familiarity, and allow him to follow his own inclinations more than at an earlier period: and if, instead of indulging all his freaks in childhood, you have carefully accustomed him to obedience and submission, without enforcing these by improper means, he will now be able to regulate his conduct with some degree of prudence.

But while caution is to be used in bestowing rewards and inflicting punishments; still rewards and punishments are indispensably necessary in the management of the child. Inspire your boy with a sense of shame, and with a generous thirst for praise. Care for him when he does well; treat him with

Education. neglect when he acts amiss. This conduct will produce much better effects than if you were at one time to chide and beat him; at another, to reward him with a profusion of sweetmeats and playthings.

Think not that children are to be taught propriety of conduct by loading their memory with rules, directing them how to act on every particular occasion. Burden them not with rules, but impress them with habits.

Be not desirous of forming them at too early an age, to all that politeness and propriety of manners which you wish to distinguish them when they become men. Let them be taught an easy, graceful carriage of body: but give yourself no concern, though they now and then blunder against the punctilios of good-breeding; time will correct their awkwardness.

With regard to that important question, whether children ought to be sent to a public school, or are likely to be better trained up in a domestic education? so impossible is it for one matter to extend his attention to a number of boys, and so likely is the contagion of vice to be caught among the crowd of a public school, that a private seems more favourable than a public education to virtue, and scarce less favourable to learning.

When you resolve to give your son a domestic education, be careful to regulate that domestic education in a judicious manner. Keep him at a distance from evil example: choose the most favourable seasons for communicating instruction: strictly enforce obedience; but never by blows, except in case of obstinacy which you find otherwise incurable. If his engagements in life prevent the parent from superintending and directing his son's education personally, let him commit him to the care of a virtuous and judicious tutor. Let the tutor be rather a man of experience in the world than of profound learning; for it is more necessary that the pupil be formed for conducting himself with prudence in the world, and be fortified against those temptations to which he will be exposed when he enters upon active life, than that his head be stuffed with Latin and logic.

Here Mr Locke, notwithstanding that his own mind was stored with the treasures of Grecian and Roman literature, takes occasion to declare himself pretty freely against that application to ancient learning, which was then indispensably required in the education of youth. He considers languages and philosophy as rather having a tendency to render the youth unfit for acting a prudent and becoming part in life, than forming for it: and he therefore insists that these should be but in a subordinate degree the objects of his attention.

Let the tutor encourage the child under his care to a certain degree of familiarity; let the pupil be accustomed to give his opinion on matters relative to himself: let him be taught justice, by finding injustice to others prejudicial to himself; let him be taught liberality, by finding it advantageous; let him be rendered superior to teasing his parents or tutor with complaints, by finding his complaints unfavourably received. That you may teach him to restrain every foolish or irregular desire, be sure never to indulge his wishes, save when you find the indulgence proper for him, and convenient for yourself. Curiosity, how-

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ever, is a principle which ought to be industriously roused in the breast of the child, and cherished there by meeting always the readiest gratification. However you may oppose the boy's inclinations in other things, yet refuse him not a proper portion of recreation: let him indulge in play, while he continues to play with keeness and activity; but suffer him not to loiter about in lifeless indolence. To restrain your child from fool-hardy courage, point out to him the dangers to which it exposes him: to raise him above timorous cowardice, and inspire him with manly fortitude; accustom him from the earliest period of life to an acquaintance with such things as he is most likely to be afraid of: subject him now and then to pain, and expose him to danger; but let such trials be judiciously conducted.

Idleness or curiosity sometimes leads children to cruelty in their treatment of such animals as are placed within their power. Dogs, cats, birds, and butterflies, often suffer from their inhumanity. But when they seem inclined to such cruelty, let them be carefully watched, and let every means be used to awake their hearts to generous sensibility. Allow them to keep tame birds, dogs, &c. only on condition of their using them with tenderness. Perhaps this unhappy disposition to cruelty is occasioned, or at least fostered, by people's laughing when they behold the impotent efforts of children to do mischief; and often going so far as even to encourage them in maltreating those creatures which are within their reach. We entertain them, too, with stories of fighting and battles; and represent characters distinguished for atrocious acts of inhumanity as great and illustrious. But let such practice be carefully restrained from, if you wish to inspire your child with generous and humane sentiments. Teach him gentleness and tenderness, not only to brute animals, but also to servants and companions.

Curiosity is to be roused and cherished in the breast of the child: but by what means? Answer his inquiries readily: though his questions be put in awkward language, let not that hinder you from attending to the objects of them. Curiosity is natural to the human mind; and if you repress not the curiosity of the child, he will often be moved by its impulse to the pursuit of knowledge. Let him find his eagerness in the pursuit of knowledge, a source of applause and esteem. Avoid the folly of those who sport with the credulity of children, by answering their questions in a ludicrous or deceitful manner.

You must, however, not only listen with obliging attention to his questions, and strive to gratify his curiosity; but even whenever he attempts to reason on such subjects as are offered to his observation, be careful to encourage him: praise him if he reasons with any degree of plausibility; even if he blunders, beware of ridiculing or laughing at him. With regard to the boy's play-things: while you indulge him freely in innocent diversions, give him such play-things as may be necessary in the amusements in which he engages, provided they be such as he cannot make himself; but it will be still better for him to exercise his dexterity and ingenuity in making them himself.

After throwing out these things concerning the general principles on which education should be carried on, Mr Locke next proceeds to those particular parts

Education. of knowledge in which he thinks every young gentleman ought to be instructed. In virtue, wisdom, breeding, and learning, he comprehends all that is necessary to enable his pupil to act a respectable part in life.

In forming the boy to virtue, the first thing to be done, is to inform him of the relation subsisting between human creatures and a supreme independent Being, their creator, preserver, and governor; and to teach him, that obedience and worship are due to that Being. But when you inform the child of the existence of an invisible Being, beware of impressing his mind with any notions concerning spirits or goblins, which may render him incapable of bearing darkness or solitude. In infancy our minds are, by the indiscretion of those about us, generally impressed with such prejudices concerning a thousand frightful forms, ever ready to assail or haunt us under the shade of night, that we become incapable of manly fortitude during the course of life: the soldier who will boldly face death in the field of battle, shall perhaps tremble and take to flight at the rustling of a few leaves, or the grunting of a hog in the dark. But were the imaginations of children not crazed with wild stories concerning spirits and hobgoblins, darkness would be no more alarming to them than light. After informing the child of the existence of a Deity, and teaching him to pray to him; next labour to impress his mind with a veneration for truth, and habituate him to a strict adherence to it on every occasion. Endeavour also to render him gentle and good-natured.

The best means you can use to teach him wisdom or prudence in conducting himself in the ordinary business and intercourse of life, is to teach him to despise the mean shifts of cunning. The rest must be learned by actual experience in life.

The decencies of life, comprehended under the word Good Breeding, form no inconsiderable part of a good education. In teaching these, two things are to be attended to: Inspire the youth with a disposition to please and oblige all with whom he is conversant; next, teach him how to express that disposition in a becoming manner. Let boisterous roughness, haughty contempt of others, censoriousness, impertinent raillery, and a spirit of contradiction, be banished from his temper and behaviour. At the same time, beware of leading him to regard the mere forms of intercourse as a matter of the highest importance. Remember that genuine good-breeding is only an easy and graceful way of expressing good sense and benevolence in his conversation and deportment.

Mr Locke, when he comes to give his opinion concerning those parts of learning which are proper to be taught a young gentleman, and the manner in which they ought to be communicated, advises to initiate the child in the art of reading, without letting him know that he is engaged about a matter of any importance, or learning an accomplishment which you are solicitous that he should acquire. Present it to him in the form of an amusement, or teach him to consider it as an high honour to be permitted to learn his alphabet; otherwise he will turn from it with disgust. When by insinuating arts you have allured him to apply to reading, put into his hands such books as are plain, entertaining, and instructive. Insist not on his reading over the bible: instead of gaining any advantage from an indiscriminate perusal

Education. perusal of it at this period of life, he is likely to acquire the most confused notions of religion, and an indifference for the sacred volume during the rest of life; yet it may be highly proper to cause him to peruse some of its beautiful historical passages, and to familiarize him with its elegant and simple moral precepts. After learning to read his mother-tongue, the boy's attention ought to be next directed to the art of writing. The easiest way to teach him that art, is to get a plate engraved, after the model of any hand which you think most proper for his imitation. With this plate get a number of copies cast with red ink; the letters of these the learner may trace with his pen filled with black ink: and he will thus in a short time, and without much trouble to you or himself, acquire a decent hand. As drawing is useful on many occasions in life; if the boy be not naturally incapable of acquiring it, he may with great propriety dedicate some part of his time and attention to that art.

When the scholar has attained a tolerable degree of skill in writing, and in reading and speaking his native language, he must next begin an acquaintance with other languages. Among these, the first object of his study will naturally be the Latin. Yet let none waste their time in attempting to acquire a knowledge of Latin, but such as are designed for some of the learned professions, or for the life of a gentleman without a profession. To these last it may be useful; to others it is wholly unserviceable. But in learning the Latin tongue, a much happier method than burdening and perplexing him with rules of grammar, would be to make him speak it with a tutor who were sufficiently master of it for that purpose. Thus might he spend that time which is usually occupied in acquiring this language, in learning some other necessary branches of education. But if you cannot conveniently have the boy taught the language by the way of conversation, let the introductory books be accompanied with an English version, which he may have easy recourse to for the explanation of the Latin. Never perplex him with grammatical difficulties. Reflect that, at his age, it is impossible to enter into the spirit of those things. Render every thing as easy and pleasing as possible; for the attention will not fail to wander, even though you labour not to render the task disagreeable. Skill in grammar may be useful; but it is to those whose lives are to be dedicated to the study of the dead languages: that knowledge which the gentleman and the man of the world may have occasion to derive from the treasures contained in the ancient languages, may be acquired without a painful study of prosody or syntax. As the learning of any language is merely learning words; if possible, let it be accompanied with the acquisition of some real knowledge of things; such as the nature of plants, animals, &c. their growth and propagation. But if you cannot or will not give your boy a private education, and are still resolved to send him to school, to be whipped through the usual course of Greek and Latin; at least act with so much good sense and humanity, as to insist that he be not burdened and tormented with the composition of Latin themes and verses. Neither let his memory be oppressed with whole pages and chapters from the classics. Such ridiculous exercises have no tendency, whatever prejudice

Education. may urge to the contrary, to improve him either in the knowledge of languages or of nature.

Mr Locke seems to wish that the French language, which in his days had attained to higher refinement and a more regular analogy than any of the other modern languages of Europe;—he seems to wish that the French were learned along with the Latin: and he wishes the study of these languages to be accompanied with the study of arithmetic, geography, history, and chronology. Let these branches of knowledge be communicated to the learner in one of the two languages; and he will thus acquire the language with greater facility. He next points out the advantages of the branches of knowledge which he recommends as proper to be learned together with the languages; but on that head he says nothing singular. One method which he recommends for facilitating the study of language is, to put into the youth's hands, as soon as he has acquired a tolerable knowledge of chronology, some of the most entertaining Latin historians: the interesting nature of the events which they relate will not fail to command his attention, in spite of the difficulty which he must find in making out their meaning. The Bible and Tully's Offices will be his best guides in the study of ethics. The law of nature and nations, as well as the civil and political institutions of his country, will form to him an important object, which he ought to study with the most careful attention. Rhetoric and logic, though generally regarded as objects of great importance in a liberal education, can neither of them contribute much, with all their rules and terms, to render him an acute reasoner or an eloquent speaker; and it is therefore unnecessary for him to honour them with very particular attention. Tully and Chillingworth will be more beneficial in teaching him to reason and to persuade, than all the treatises on rhetoric and logic which he can possibly peruse, or all the lectures on those arts which he can gain opportunities to hear. In every art and every science, practice and experience are infinitely better than rules. Natural philosophy, as contributing to inspire the breast with warmer sentiments of devotion, and serving also to many useful purposes in life, ought to make a part in the young gentleman's studies. But the humble experimental writers on that subject are to be put into his hands in preference to the lofty builders of systems. As for Greek, our pupil is not to be a professed scholar, but a gentleman and a man of the world; and therefore it does not appear necessary that Greek should make a part in the system of his education. But in none of these studies will the pupil ever attain any proficiency, unless he be accustomed to method and regularity in the prosecution of them. In languages, let him gradually ascend from what is simplest to what is most difficult: in history, let him follow the order of time; in philosophy, that of nature.

Dancing, as contributing to ease and gracefulness of carriage, ought to make a part in our young gentleman's education. Fencing and riding being fashionable, cannot well be denied him. As he is likely, in the course of life, to have some leisure hours on his hands, and to be sometimes disposed to active recreation, let him learn some mechanical trade, with the

Education. exercise of which he may agreeably fill up some of those hours. If he is to possess any property, let him not be unskilled in the management of accounts. Travel, instead of being useful, appears more likely to be hurtful to the understanding and morals of the traveller, unless deferred to a later period than that at which young men are usually sent out to complete their education by travelling through foreign countries.

Here Mr Locke concludes his work with observing, that he does not offer it to the world as a full or comprehensive treatise on the subject of education; but merely as the outlines of what occurred to him as most proper to be observed in breeding up a young gentleman not intended for any learned profession or mechanical employment, but for acting a respectable part in life at the head of a competent hereditary fortune.

23 Remarks. In considering the sentiments of this respectable philosopher on the subject of education, we perceive, that as he was, on the one hand, superior to those prejudices which render us incapable of distinguishing the defects or absurdities of any custom or institution which has long prevailed; so, on the other hand, he was free from that silly vanity which disposes those who are subject to its influence to affect novelty and singularity of sentiment on every subject which they consider. Though a member of one of the universities, he hesitates not to declare himself against a very laborious attention to classical learning; and his reasoning is, through the whole of his treatise, rather plain and solid than subtle or refined.

Yet, however we respect the soundness of his understanding or the benevolence of his intentions, we cannot avoid observing, that his opinions are not always such as experience justifies. He had no doubt taken notice of some instances in which the too great anxiety of parents about the preservation of their children's health was the very means of rendering their constitution feeble and tender through the course of life; and from that circumstance might be led to propose those expedients which he mentions for preserving the health and strengthening the constitution of children. But a little more observation or inquiry would have easily convinced him, that some of his expedients, instead of strengthening the child's constitution, would in all probability shorten his days.

He had perhaps seen some of the heroes of classical literature, who were familiar with Demosthenes and Cicero, and had Homer and Virgil at their fingers ends,—he had seen some of those gentlemen so overloaded with their cargo of Greek and Latin as to be unfit for the ordinary business and intercourse of life; and such instances might tempt him to forget the advantages which he himself, and a long series of philosophers, patriots, and statesmen, with whose names the annals of our country are adorned, had derived from a regular classical education. But as we are afterwards to deliver our own sentiments on this subject, we will not here extend our observations on Mr Locke to a greater length.

24 Rousseau An author more distinguished than Mr Locke, for tenderness of sentiment, singularity, eloquence, and whim, has presented the public with a work on the subject of education, in which he, with unexampled boldness, inveighs against all the established modes, as well as as reprobrates whatever had been advanced by former writers on the subject; and, at the same time, deli-

neates a plan of education which he would persuade us **Education:** is infinitely superior to those which he explodes. This writer is the amiable and pathetic Rousseau: And tho' he be often vain, paradoxical, and whimsical; yet the charm of genius and sentiment which adorns his writings will at least engage our attention while he unfolds his opinions.

He sets out with observing, that our business in the bringing up of children should be, to second and to manage-call forth nature; and that, instead of this, we almost always oppose her intentions and operations. As soon as the child sees the light, he is wrapped in swathing bands. His limbs are thus restrained from that free motion which is necessary to their growth and vigour; and even the internal parts of his frame are rendered incapable of their proper functions. Mothers are too proud or indolent, or too fond of gaiety and dissipation, to submit to the task of nursing their own children. The poor infants are committed to some hireling nurse, who not being attached to them by natural affection, treats them with negligence or inhumanity. But is that mother capable of any delicacy of sentiment, who can permit another to suckle her child, and to share with her, or perhaps wholly supplant her, in the filial affection of that child?

Again, when parents undertake the care of their infant children, they often injure them by mistaken tenderness. They pamper them with delicate meats, cover them with warm clothes, and anxiously keep them at a distance from all that has the appearance of danger: not attending to the economy of nature, who subjects us in infancy to a long train of epidemical distempers, and exposes us during the same period to innumerable dangers; the design of which doublets is, to teach us a prudent concern for our own safety, and to strengthen and confirm our constitutions.

A child no sooner enters into life, than it begins to cry; and during a great part of infancy continues frequently to shed tears. We either attempt to soothe it into good nature, or seek to silence it by harsher means; and it is thus we infuse into its infant mind those evil passions which we afterwards presume to impute to nature.

As the mother generally disdains to nurse her own child, so the father is seldom at leisure to take any share in the management of his education: he is put into the hands of a tutor. But that tutor whose time and attention can be purchased for money is unworthy of the charge. Either be yourself your son's preceptor, or gain a friend whose friendship to you shall be his sole motive to undertake the task.

After a few preliminary observations to the above purport, our author introduces his **Emilius**; in whose education he delineates that plan which he prefers. The preceptor whom he would assign **Emilius** must be young; and must dedicate his attention to **Emilius** alone, from the time when his pupil enters the world till he attain the full age of manhood. **Emilius**, to receive the full benefit of his preceptor's system of education, and to afford full scope to it, must possess a genius of the middle class; no prodigy of parts, nor singularly dull; he must have been born to affluent circumstances and an elevated rank in life. His preceptor is invested with the rights, and takes upon him the obligations, of both father and mother. **Emilius** is, when put into

25 Imprudent
management of
children in
infancy.

26 Manage-
ment of E-
milus dur-
ing infan-
cy.

Education.

into the hands of his preceptor, a well-shaped, vigorous, and healthy child. The first care of the preceptor is to provide him with a nurse, who, as he is new born, must be newly delivered: it is of still higher importance that she be clean, healthy, virtuous, and of mild dispositions. While suckling her charge, she shall feed plentifully, chiefly on a vegetable diet. The child must be frequently bathed, in cold water if possible; if you begin with warm, however, use it by degrees colder and colder, till at length he is able to bear it entirely cold. He is not to be wrapped in swaddling-clothes or rollers, or bound with stay-bands; but put in good warm blankets and in a roomy cradle: Let him stretch and move his limbs at freedom, and crawl about on hands and knees at his pleasure. The greatest care must now be taken to prevent the child from contracting any habits whatever: Suffer him not to use one arm more than another, or to eat or sleep at stated hours. Prepare him for the enjoyment of liberty, by preserving to him the exercise of his natural abilities, unfettered by any artificial habits.

As soon as the child begins to distinguish objects, let his education begin. Some objects are naturally agreeable, others frightful. Accustom him to look upon any object that may come in his way without being affrighted. Children are at first ignorant of local relations, and learn to distinguish them only by experience; and while *Emilius* is yet an infant, incapable of speaking or walking, he may be assisted in acquiring the knowledge of these.

In his feeble helpless condition, the child must feel many wants and much uneasiness; tears are the language which nature has given him to make known his distresses and wants. When the child cries, it would be much more prudent and humane to examine what he suffers or stands in need of, than, as is usually done, to rock or sing him asleep; or, when these means succeed not, to threaten or use him brutally.

In managing children, as nature has endowed them with no superfluous powers, we ought not to confine them from the free use of those which they are able to exert. It is our duty to supply their deficiency both of mental and bodily powers; but while we are ready to administer on every occasion to their real wants, we must beware of gratifying their caprice or unreasonable humours. In order to distinguish between their natural and fantastic wants, we must study the language and signs by which they express their wishes and emotions. Though crying be the means which nature has given infants to enable them to procure relief or assistance, yet when they cry they are not always in need of either. They often cry from obstinacy or habits of peevishness. But if, instead of attempting to soothe them by diverting their attention to other objects, we would on such occasions entirely neglect them, they would soon cease to indulge in such fits of crying.

When children begin to speak, we are usually anxious about their language and articulation, and are every moment correcting their blunders. But instead of hoping to teach them purity or correctness of speech by such means as these, let us be careful to speak easily and correctly before them, and allow them to express themselves in the best manner they can. By such means we will be much more likely to obtain our wishes

Education.

in this matter. When they speak, let us not listen with such solicitude as to relieve them from the necessity of using an open distinct articulation.

* When the child attains the power of expressing himself in artificial language, he may then be considered as having reached the second period of infancy. He needs not now to make known his wants by tears, and should therefore be discouraged from the use of them. Let his tears be entirely neglected. He now begins to run about, and you are anxious to prevent him from hurting himself; but your anxiety can only render him peevish or timid. Remove him from any very alarming danger, and then suffer him to run about at his pleasure. He will now and then bleed, and hurt himself; but he will become bold, lively, and cheerful.

In regulating the conduct of your child, let him know that he is dependant; but require not of him an implicit submission to your will. Let his unreasonable desires be opposed only by his natural inability to gratify them, or by the inconveniences attending the gratification. When he asks what is necessary or reasonable, let him instantly obtain it; when he asks what is unreasonable or improper, lend a deaf ear to all his intreaties and demands. Beware of teaching him to establish his authority over you by means of the forms of politeness. A child will scarce take the trouble to address you with *If you please*, unless he has been made to regard these as a set of magic syllables, by the use of which he may subject every person to his will. His *If you please* then means *I please; pray*, with him, stands for *do*. Though you put in his mouth the words of humility, his tone and air are those of authority that will be obeyed.

Sacrifice not the present happiness of your child for the sake of any distant advantage.

Be not too anxious to guard him against natural evil. The liberty which he enjoys while he is now and then permitted to expose himself to blows, or cold, or wetness, is more than a sufficient compensation for all that he thus suffers.

Seek not to impress him with ideas of duty or obligation. Till children reach the years of discretion, moral ideas of they are incapable of any notions of the distinctions of morality. Avoid therefore even the use of the terms by which these are expressed in their hearing. While they continue to be affected only by sensible objects, seek not to extend their ideas beyond the sphere of sensation. Try all the powers of language, use the plainest and most familiar methods you can contrive; you shall still be unable to give the boy at this age any just ideas of the distinction between right and wrong. He may readily conceive, that for one set of actions you will punish him, and that by another he will obtain your approbation; but farther than this his ideas of right and wrong, of virtue and vice, cannot yet be carried.

The powers of the human mind are gradually unfolded. At first, the infant is capable only of perception; by and by, his instincts and passions begin to exert their force; at length, as he advances towards manhood, reason begins to act, and he becomes able to feel the beauty of virtue and the deformity of vice.

But though you seek not to regulate his conduct by

27
Subjection
to authority.

28
ideas of
moral obligation.

by

by notions of *duty*, yet let him feel the yoke of necessity. Let him know, that as he is weaker than you, he must not, therefore, expect that you should be subject to his will; and that, as he has neither skill nor strength to control the laws of nature, and make every object around him bend to his pleasure, he cannot hope to obtain the gratification of all his wishes. Thus you teach him virtue before he knows what virtue is; and call forth his reason without misleading or perverting it. Let him feel his impotence; but forbid him not to think, that if he had power there would be no reason why he might not at pleasure even turn the world upside down.

Hitherto you have given your pupil no verbal instructions, nor must you yet attempt to instruct him by any other means than experience; let all his knowledge be literally of his own acquisition.

Let not the parent who has observed the conduct of children brought up in the usual way be afraid that, if his child should be treated like our pupil, he would become stupid and vicious. Nature sends not human beings into the world with a predisposition to vice: we sow the seeds of it in the infant heart; and by our absurd modes of treatment, we also enfeeble and pervert the powers of the understanding.

But from the hour of his birth till he attain the age of twelve, the education of *Emilius* shall be purely negative. Could we but bring him up healthy and robust, and entirely ignorant, till that period, the eyes of his understanding would then be open to every lesson: free from the influence of habit and prejudice, his passions would not then oppose us; and we might render him the wisest and most virtuous of men. If we can but lose time, if we can but advance without receiving any impressions whatever, our gains are unspeakable. Nature gives the powers of every mind some particular direction: but that particular bias, impressed by the hand of nature, cannot be distinguished before the period we have mentioned; and if you counteract nature, instead of seconding her views, the consequences cannot but be highly unfavourable both to the heart and the understanding of your pupil.

Perhaps, in the midst of society, it may be difficult to bring up our pupil without giving him some idea of the relations between man and man, and of the morality of human actions. Let that, however, be deferred as long as possible.

Were *Emilius* to witness a scene of anger, and to ask the cause of the appearances which he beheld, he should be told that the persons were affected with a fit of sudden illness. We might thus perhaps prevent the unhappy effects of such an example.

The first moral notions which should be communicated to the child are those of property. To communicate the ideas of property to our pupil, we will direct him to take possession of something; for instance, of a piece of ground belonging to some other person, and in a state of cultivation. Let him cultivate this spot of ground anew, sow it with seeds, and look eagerly forward to the time of harvest in the hopes of reaping the fruit of his labours. In the mean time, let the proprietor of the ground take notice of what is done, destroy your pupil's rising crop, and complain of the injustice done him. While the boy laments his loss and the disappointment of his hopes, in all the

bitterness of grief, let the proprietor of the ground still insist on the injury done him, and complain of what he suffers by the purpose for which he himself had cultivated and sown the ground being frustrated. Our pupil, now sensible of the reasonableness of the other's claims, will desist from his lamentations, and only beg to have some other spot assigned him which he may cultivate at his pleasure without offending any person. This he will justly consider as his own property, to the productions of which raised by his own labour he has an exclusive right, and in the occupying of which none ought to molest him. In some such manner as this may the nature of property, the idea of which easily refers in this instance to the first occupier, and afterwards the exchange of property, be explained to him.

Another instance of the manner in which the pupil is now to be managed may not be improper in this place. He is possibly too rude and boisterous as to spoil or break whatever is within his reach. Be not angry with him, however, if he break the utensils which he has constant need of; be in no haste to supply him with others in their room; let other things be removed out of his way: if he break the windows of his apartment, let him be exposed night and day to the cold; complain not of the inconvenience yourself, but order matters so that he may feel it. After some time, let them be mended up; and if he break them again, change your method. Tell him calmly, "These windows are mine; I took care to have them put there; and I will prevent their being again broken, by confining you in a dark room." Let all his endeavours to avoid this prove ineffectual. Let him be actually confined, and be liberated only on proposing and agreeing to the condition of breaking no more windows. When he proposes this condition, be ready to listen to him; observe that it is well thought on, and that it is a pity he did not think of it sooner. Consider this engagement between you as sacred; treat him as before, and you cannot fail to attain the end in view.

The moral world now opens to us: But no sooner are we able to distinguish between right and wrong, than we become desirous to conceal those instances in which we act wrong. Lying is therefore a vice of which your pupil is now apt to be guilty: you cannot always prevent, but you can punish; but let the punishments which you inflict appear to the child only the natural consequences of his conduct. If he is in any instance convicted of a lie, let his assertions no longer gain credit. By this means, sooner than by precepts, or any other species of punishment, will you be able to reclaim him from the habit of lying.

The methods generally taken to render children virtuous are preposterous and foolish. To render them generous and charitable, we give them money, and bid them bestow it in alms, while we ourselves give nothing; but the parent or master, and not the child, should bestow the alms. Example might produce the wished-for effect. Besides, children are strangers to the value of money. A gingerbread cake is more to them than an hundred guineas. Though you teach them to give away money, till you persuade them to part readily with those things which they value most, you do not inspire them with generosity. Would you make them liberal

Education. by showing them that the most liberal is always best provided for? this is to teach covetousness, not liberality. Example is the only means by which you can, at this period, hope to teach your pupil any of the virtues.

The only lesson of morality that can with any propriety be inculcated on children, is to injure no person. Even the positive precept of doing good, must be considered as subordinate to this negative one of doing no harm. The most virtuous and the most exalted of characters, is the man who does the least harm to his fellow-creatures.

In a public education, it will be necessary to attempt the communication of moral instruction at an earlier period than in a private one. In a private education, it will always be best to allow the moral powers of children to ripen as much as possible before you endeavour to inform and direct them by precepts.

There is an inequality among geniuses; and fond mothers and fathers may be disposed to plead for exceptions in favour of such of their children as they view with a partial eye. "This boy's mind is more capacious, his powers are riper, than those of others." But however great the seeming disparity of geniuses may be, it is at bottom but inconsiderable. Let the age of children be therefore regarded as a common measure by which their treatment is to be regulated.

However quick and tenacious the memories of children may seem, they can derive little advantage from the exertions of memory till such time as judgment begins to act. All the knowledge that they acquire in the course of the usual system of education, is merely the knowledge of words. The languages, geography, chronology, in short all that they are taught, and called to display so ostentatiously at this period of life, serve no other purpose than to fill their minds with words.

History is esteemed a proper thing to be put into the hands of children. But except you wish to confine their attention to the external and physical actions, it is almost nothing they can acquire by the perusal of it. And if divested of the moral distinctions of actions, of the workings of the passions, and the complication of interests, what is there to render history entertaining? We may indeed easily teach them to repeat the words *kings, emperors, wars, conquests, revolutions, laws*: but of the things which you use these words to denote, you will find they are hitherto incapable of forming any clear ideas.

But the mere knowledge of words is not science; make your pupil acquainted with things, and he will not fail to acquire their names. Emilius must never be set to get any composition by heart, not even fables: be careful to place before him those scenes and objects, the images of which it may be useful for him to have impressed on his memory; but by no other means seek to assist him to improve that faculty.

Emilius shall not even learn to read till he attain the age of twelve: for, before that period, it can be of no benefit to him; and the labour would only make him unhappy during that period of life which is naturally the golden part of our days. But when he has attained the proper age, matters shall be so ordered, that he shall find his ignorance of letters an inconvenience. A card shall be sent him, which being unable

to read, he will apply to some of those about him. **Education.** They may be unwilling to oblige him, or otherwise engaged. If, at length, it is read to him, that may be when it is now too late to take advantage of some agreeable invitation which it contained. This may be two or three times repeated. At length he becomes eager to learn to read; and accomplishes that almost without assiduity.

The principle on which we proceed, is to leave the pupil almost wholly under his own direction, seemingly at least; to lead him to acquire new accomplishments, solely from the desire of increasing his powers, and extending his influence; and humbly to follow nature, not to force her.

As we are desirous of cultivating his understanding, the means which we employ for that purpose is, to cultivate those abilities on which it depends; he is always active and in motion. Let us first make him a man in point of health and vigour, and he will soon become a man in understanding.

By our constant attention to the welfare of children, we render it unnecessary for them to attend to it themselves. What occasion has your son or pupil to observe whether the aspect of the sky threaten rain, when he knows that you will take care to have him sheltered from a shower? or to regulate the length of his excursions, when he is sure that you will not suffer him to lose his dinner?

While matters are so ordered that Emilius thinks himself subject only to his own will, though all his motions are regulated according to your pleasure; instead of becoming fantastic and capricious, he insensibly acquires the habit of keeping utility in view in all his actions.

The first objects which engage the attention of children are the appearances of the material world around them: our first study is a kind of experimental philosophy; our instruments and instructors are our hands, our feet, and our eyes. By exercising these bodily organs, the boy will acquire more real knowledge even in the period of childhood, than if we should dedicate nine-tenths of his time to books, from the age of six to sixty. All who have examined, with any sagacity, the characters, circumstances, and manners of the ancients, have agreed in attributing to their gymnastic exercises that superior strength of body and mind which renders them objects of admiration to the moderns.

Our pupil's clothes cannot be too light and easy. If tight and close, they fetter and confine his joints and limbs, and likewise obstruct the circulation of the blood; if accustomed to warm clothing, he will soon become incapable of bearing cold.

In every thing let him be habituated to what is plain and hardy. Let his bed be coarse and hard, his and exercise plain, his fare simple. Infants must be freely and indulged in sleep: but as Emilius is now advanced beyond infancy, he must be accustomed at times to go to bed late and get up early, to be sometimes hastily waked from sleep; and thus to prepare himself for what he may afterwards have occasion to submit to in the course of life.

As this period is in a particular manner that of exercise, and Emilius is encouraged to take as much exercise as he chooses; we must endeavour to prompt, but

29
History,
how far
proper to
be put in-
to the
hands of
boys.

30
Exposure

^Education, but without seeming to direct him to such as are most proper. Swimming, though not generally attended to, is yet one of the first which a boy ought to learn. It may, in many occasions in life, be of the greatest advantage, by enabling us to save our own life or the life of others. *Emilius* shall be taught to swim; he shall be taught whatever can really enlarge the sphere of his power: "could I teach him to fly in the air, I would make him an eagle; if to bear the fire, a salamander."

To exercise the senses is not merely to make use of them; it is to learn to judge by them. Call not your pupil to exert all his strength on every occasion; but let him learn to judge of the truth of the information which he receives from one sense, by having recourse to the evidence of another.

It is not impossible to improve the senses to an higher degree of perfection than that which they usually attain. Blind men generally possess the sense of touch in a more exquisite degree, than we who have also eyes to guide and inform us. But they acquire this superior delicacy and acuteness of sensation, only by their finding it necessary to have more frequent recourse to the information of that sense. Here is then a wide field for improvement and agreeable exercise to our pupil.

³¹
Darkness
and goblins.

What a variety of useful diversions might he be led to entertain himself with in the course of the night. The hours of darkness are generally hours of terror, not only to men, but also to the brute animals. Even reason, knowledge, and courage, are not always sufficient to render us superior to the terror which darkness inspires.

This timidity is usually attributed to the tales of goblins and ghouls with which we are frightened in infancy. But it originates from another cause; our ignorance of what is passing around us, and our inability to distinguish objects during that period of darkness. The passion of fear was implanted by nature in the human breast, in order that it might serve to put us on our guard against danger. But in consequence of our being subject to the influence of that passion, when we are ignorant of what surrounds us, imagination calls up dangers on all hands. And such is the cause from which our terror in darkness naturally arises.

But the only way to free our pupil from this tyranny of imagination, is to oppose to it the power of habit. A bricklayer or tyler is never giddy on looking down from the roofs of houses. Neither will our pupil be alarmed by the terrors of darkness, if he be accustomed to go frequently abroad under night. It is easy to contrive a number of little amusements, the agreeableness of which may, for a time, overcome our pupil's aversion for darkness; and thus may a habit be at length impressed.

Let us yet get another instance of the means by which children may be led to do what we wish, without our imposing any restraint on their will. Suppose *Emilius* is lazy and inactive, and we wish to make him learn to run. When walking out with the young sloop after dinner, I would sometimes put a couple of his favourite cakes in my pocket; of these each of us should eat one in the course of our walk. After

some time I would show him I had put a third cake in my pocket. This he would not fail to ask after finishing his own: no, says I, I can eat it myself, or we will divide it — or stay, we had better let these two little boys there run a race for it. Accordingly I propose the race to the boys; who readily accept the conditions, and one of them carries off the prize. After seeing this several times repeated, *Emilius* begins to think himself qualified to obtain the third cake as well as any of the little boys, and to look upon running as an accomplishment of some consequence. He seeks an opportunity of being permitted to enter the lists. He runs; and after being two or three times outstripped, is at length successful, and in a short time attains an undoubted superiority.

As children naturally imitate almost whatever they behold, they are often disposed to attempt drawing. In this our pupil might be indulged, not merely for the sake of the art, but to give him a steady hand and a good eye. But he should draw from nature, not from other drawings or from prints. Were he to draw the likeness of a horse, he should look at the animal: if to attempt a representation of a house, he should view the house itself. In this method he will, no doubt, scratch for a long time without producing any likeness; but he will acquire what we proposed as the ends of his attempting to draw; namely, steadiness of hand and justness of sight, by this method, sooner than by any others.

³²
Drawing.

Geometry, when taught in the usual way, is certainly above the capacity of children; they cannot go along with us in our reasonings: Yet they are not totally incapable of acquiring even this difficult science; if, when they are prosecuting their amusements, you lead them insensibly to observe the properties of the circle, the triangle, and the square, and place them now and then in circumstances when they may have occasion to apply their knowledge of these to real uses in life.

³³
Geometry.

A child has been taught the various relations between the outlines, surfaces, and contents of bodies, by having cakes set before him, cut into all manner of regular solids; by which means he was led to master the whole science of Archimedes, by studying which form contained the greatest quantity.

There is a period between infancy and the age of puberty at which the growth and improvement of our faculties exceed the increase of our desires. About 12 or 13, when the appetite for the sex has not yet begun to make itself felt, when unnatural wants are yet unknown, no false appetites yet acquired; at that period, though weak as a man, as a child the youth is strong.

This interval, when the individual is able to effect more than is necessary for the gratification of his wishes, contains the most precious moments of his life, which ought to be anxiously filled up in a useful manner. This is the best time for employment, for instruction, for study.

Now, let us begin to consider what is useful; for, hitherto, we have only inquired what was necessary. In entering on our studies, we will make no account of any but such as instinct directs us to pursue: those which the pedants and the pretended philosopher are im-

Education. impelled to pursue solely from the desire of attracting the admiration of mankind, are unworthy of our notice.

"The earth which we inhabit, and the sun by whose beams we are enlightened, are the first objects which claim our attention. We will therefore direct the attention of our pupil to the phenomena of nature. We will lead him to the knowledge of geography, not by maps, spheres, and globes: we will lead Emilius out on some beautiful evening to behold the setting sun. Here we take particular notice of such objects as mark the place of his going down. Next morning we visit the spot to contemplate the rising of the glorious luminary. After contemplating for some time the successive appearances which the scene before us assumes, and making Emilius observe the hills and the other surrounding objects, I stand silent a few moments, affecting to be occupied in deep meditation: At last I address him thus: "I am thinking, that, when the sun set last night, it went down yonder; whereas this morning, you see he is risen on the opposite of the plain here before us. What can be the meaning of this?" I say nothing more at this time, but rather endeavour to direct his attention to other objects.

This is our first lesson in cosmography.

Our last observation was made about Midsummer; we will next view the rising sun on some fine morning in the middle of winter. This second observation shall be made on the very same spot which we chose for the former. When Emilius and I perceive the sun now emerging above the horizon, we are struck at the change of the place of his rising.—By such lessons as these may the pupil be gradually taught a real, not a seeming, acquaintance with the relative motions of the sun and the planets and with geography.

During the first period of childhood, the great object of our system of education was to spend our time as idly as possible, in order that we might avoid employing it to an ill purpose: but our views are now changed with our pupil's progress in life; and we have scarce enough of time for the accomplishment of our necessary pursuits. We therefore proceed as quickly as possible in making ourselves acquainted with the nature of the bodies around us, and the laws by which their motions and appearances are regulated. We keep to this study at present, as being necessary for the most important purposes in life, and as being the most suitable to the present state of our pupil's powers. We still begin with the most common and obvious phenomena of nature, regarding them as mere facts; and, advancing from these, we come to generalize by degrees.

As soon as we are so far advanced as to be able to give our pupil an idea of what is meant by the word *useful*, we have attained a considerable influence over his future conduct. On every occasion after this a frequent question between us will be, Of what use is that? This shall be the instrument by means of which I shall now be able to render him absolutely submissive to my wishes. However, I will allow him to make use of it in his turn, and will be careful not to require of him to do or learn any thing the utility of which he cannot comprehend.

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Books only teach people to talk about what they Education. do not understand. Emilius shall have as little recourse as possible to books for instruction. Yet if we can find a book in which all the natural wants of man are displayed in a manner suitable to the understanding of a child, and in which the means of satisfying those wants are gradually displayed with the same ease and simplicity; such a book will be worthy of his most attentive study. There is such a book to be found; but it is neither Aristotle, nor Pliny, nor Buffon; it is Robinson Crusoe. Emilius shall have the adventures of Robinson put into his hands: he shall imitate his example; even affect his dress; and, like Robinson, learn to provide for himself without the aid of others.

Another employment of Emilius at this period shall be, to visit the shops of various artificers; and when he enters a shop, he shall never come out without lending a hand to the work, and understanding the nature and the reason of what he sees going forward.

Still, however, we are careful to afford not a hint concerning those social relations the nature of which he is not yet able to comprehend.

The value and importance of the various arts are ordinarily estimated, not according to their real utility, but by a very injudicious mode of estimation: Those which contribute in a particular manner to the gratification of the fantastic wishes of the rich, are preferred to those which supply the indispensable necessities of life. But Emilius shall be taught to view them in a different light. Robinson Crusoe shall teach him to value the stock of a petty ironmonger above that of the most magnificent toy-shop in Europe. Let us establish it as a maxim, that we are to lead our pupil to form just notions of things for himself, not to dictate to him ours. He will estimate the works both of nature and art by their relation to his own convenience; and will therefore regard them as more precious than gold—a shoemaker or a mason, as a man of more importance than the most celebrated jeweller in Europe.

The intercourse of the arts consists in the reciprocal exchange of industry; that of commerce, in the exchange of commodities; and that of money, in the exchange of bills and cash. To make our pupil comprehend the nature of these, we have now only to generalize and extend to a variety of examples those ideas of the nature of property, and of the exchange of property, which we formerly communicated to him. The nature of money, as bearing only a conventional value, which it derives from the agreement of men to use it as a sign for facilitating commerce, may be now explained to Emilius, and will be easily comprehended by him. But go no farther: seek not yet to explain to the child in what manner money has given rise to the numerous chimeras of prejudice and caprice; nor how countries which abound most in gold and silver, come to be the most destitute of real wealth.

Still our views are directed to bring up our pupil in such a manner that he may be qualified to occupy any place in the order of society into which even the caprice of fortune can throw him. Let us make him a man; not a slave, a lord, or a monarch. How much superior the character of a king of Syracuse turned

U u schoolmaster

Education. Schoolmaster at Corinth, of a king of Macedon become a notary at Rome, to an unhappy Tarquin incapable of supporting himself in a state of independence when expelled from his kingdom!

36
The propriety of making a young man, in whatever sphere of life, learn a trade.

Whatever be our situation in the world, we can contribute nothing but our personal abilities to society. To exert them is therefore the indispensable duty of every one who enjoys the advantages of a social state; and to cultivate them in our pupil to the best purpose, ought to be the great aim of every course of education. *Emilius* has already made himself familiar with all the labours of husbandry; I can therefore bid him cultivate the land which he inherits from his father. But if it should be lost, what shall be his resource? He shall learn a trade, that he may be provided against such an accident. And he shall not be a politician, a painter, a musician, or an architect; to gain employment for his talents in any of these arts, would cost him no less trouble than to regain his lost estate. He shall learn some simple mechanical art: he will then need only to step into the first shop he sees open, to perform his day's labour, and receive his wages.

It may be here proper to take notice of a mistake into which people generally fall in determining the trade or profession in which they are to place their children. Some accident disposes the child to declare himself for a particular employment: the parent regards that as the employment to which his talents are fitted by the design of nature; and permits him to embrace it without inquiring whether another would have been more suitable or advantageous. But because I am pleased with my occupation, I am not to that account necessarily qualified for it. Inclinations do not confer abilities. It requires more careful and accurate observation than is generally imagined, to distinguish the particular taste and genius with which nature has endowed the mind of a child. We view him carelessly, and of consequence we are apt to mistake casual inclination for original disposition.

But *Emilius* needs not now to hesitate about the occupation which he is to choose. It is to be some mechanical employment. All the distinction we have now to make is, to prefer one that is cleanly and not likely to be injurious to his health. We shall make choice of that of a joiner. We cannot dedicate all our time to the trade; but at least for two days in the week we will employ ourselves in learning our trade. We will have no workshop erected for our convenience, nor will we have a joiner to wait on us in order to give us the necessary instructions: but for the two days in every week which we dedicate to the purpose of learning a trade, we will go to our master's workshop; we will rise before him in the morning; work according to his orders; eat at his table; and, after doing ourselves the honour of supping with his family, return to our own hard mattresses at night. We shall be treated only according to the merit of our performances. Our master shall find fault with our work when clumsy or negligently done, and be pleased with it only when well executed.

37
New ideas suggested to *Emilius* by his application to a trade.

While my pupil has been accustomed to bodily exercise and manual labour, his education has been hitherto conducted in such a manner as to give him insensibly a taste for reflection and meditation. Before he has been long a workman, therefore, he will begin

to become more sensible of that inequality of ranks which takes place in the order of society. He will therefore take notice of his own dependence, and of my apparent wealth, and will be desirous to know why I contribute not my personal exertions to society. I put off the question with telling him, that I bestow my superfluous wealth on him and the poor; and will take to make a bench or table every week, that I may not be quite useless to the public.

And now when about to enter the most critical period of life, when just on the brink of that age at which the heart and blood begin to feel the impulse of a new appetite, what progress has our pupil made? what knowledge has he acquired? All his science is merely physical. Hitherto he has scarce acquired any ideas of moral relations; but the essential relations between men and things he has attentively studied. He knows the general qualities of certain bodies; but upon those qualities he has not attempted to reason. He has an idea of abstract space, by means of geometrical figures; of abstract quantity, by means of algebraical signs. He has no desire to find out the essence of things; their relations alone interest him. He values nothing external but from its relation to himself. The general consent of mankind, or the caprice of custom, have not yet given any thing a value in his eyes; utility alone is his measure of estimation. He is laborious, temperate, patient, resolute, and bold. His imagination never exaggerates danger. He scarce knows as yet what death is; but should it approach him, he is prepared to submit to necessity. He is virtuous in every thing relative merely to himself. He is prepared to become a virtuous member of society as soon as he shall be made acquainted with the nature of his social relations. He is free from vice and error as far as is possible for human nature. He considers himself as unconnected with others; requires nothing from any person, and thinks none has a right to require any thing of him. Sure a youth arrived thus at his fifteenth year has not mispent the period of his infancy.

But now our pupil has reached the most critical period of life. He now feels the influence of the passion for the sex; and as soon as we become subject to the influence of that passion, we are no longer unsocial beings. The want of a mistress soon produces the want of a friend.

As hitherto we have been careful not to force or anticipate nature, so even now our attention must be directed to divert the impulses of that dangerous appetite which now begins to make itself felt. To confine the growing passions within proper limits, let it be our care to defer as long as possible the time at which they begin to display themselves. For this purpose, let us cautiously guard our words and actions in the presence of our pupil. Let us be careful to give him no premature instructions.

To excite and cherish that sensibility of mind which now first begins to show itself, to extend the care of the youth beyond himself, and to interest him in the welfare of his fellow creatures; let us be careful to put such objects in his way as have a tendency to call forth and refine the feelings. It is not possible for the human heart to sympathize with those who are happier than ourselves: our sympathy is moved only by the sight of misery. We pity in others only those distresses

Education. *Progreſſe* that *Emilius* has made, before the age of puberty.

New measures to be adopted in his education at that age.

Education. ses to which we ourselves are liable; and our pity for the misfortunes of others is measured, not by the quantity of the evil, but by the supposed sensibility of the sufferer. Let these observations serve to direct us in what manner we are to form the minds of children to humanity and compassion.

In prosecution of our design, to retard rather than accelerate the growth of the passions, let us, when that critical period which we have so much feared comes on, exclude him as much as possible from the intercourse of society, where so many objects appear to inflame the appetites. Let us be circumspect in the choice of his companions, his employment, his pleasures. Let all our care be directed to nourish his sensibility without inflaming his desires. As his moral powers now begin to unfold themselves; in cultivating them, let us proceed not by way of lecture, or by directing his attention to books, but still by leading him to acquire experience. At length the period will arrive for communicating to him some religious instruction. When he knows the nature of his relations to society, he may be informed of his relation to and dependence upon a Deity.

[The creed of the Savoyard curate, containing those sentiments concerning religious matters which Rousseau seems to propose as the most proper to be inculcated on his pupil, comes next in the order of the work; but it does not appear to be so closely connected with the subject of education as to render it proper for us to give a view of it in this place. The sentiments which he there advances, the reasonings which he urges, are evidently hostile to revealed religion; and the power of his eloquence has adorned slight and superficial arguments with such a charm, that even the sternest believer, if not absolutely destitute of taste and feeling, must read them with delight.]

And now, notwithstanding all my arts, I can no longer keep back that moment which I have endeavoured to defer to as late a period as possible. As soon as I perceive that it has certainly arrived, I no longer treat Emilius as my pupil or disciple, but as my friend. His affections are now expanded beyond himself; his moral powers have begun to exert themselves, and have received some cultivation; he also is become capable of religious sentiments, and instructed in the nature of his relation to a supreme Being. Besides, it is now requisite, if we consider the period to which nature has conducted him, that he should no longer be treated as a simple child. Hitherto ignorance has been his guardian, but now he must be restrained by his own good sense.

Now is the time for me to give him in my accounts; to show him in what manner his time and mine have been employed; to acquaint him with his station and mine, with our obligations to each other, his moral relations, the engagements he has entered into with regard to others, the degree of improvement which he has attained, the difficulties he will hereafter meet with, and the means by which he may surmount them:—in a word, to point out to him his critical situation, and the new perils which surround him; and to lay before him all the solid reasons which should engage him to watch with the utmost attention over his conduct, and to be cautious of indulging his youthful desires.

Books, solitude, idleness, a sedentary and effeminate life, the company of women and young people, are what he must carefully avoid at this age. He has learned a trade, he is not unskilled in agriculture; these may be means, but not our only means, for preserving him from the impulse of sensual desire. He is now too familiar with these: he can exercise them without taking the trouble to reflect; and while his hands are busy, his head may be engaged about something quite different from that in which he is employed. He must have some new exercise which may at once fix his attention and cause him to exert his bodily powers. We can find none more suitable for this purpose than hunting. Now, therefore, Emilius shall eagerly join in the chase; and though I do not wish him to acquire that cruelty of disposition and ferocity of temper which usually distinguish those who dedicate their lives to that barbarous diversion, yet at present it may have the happiest effects in suspending the influence of the most dangerous of passions.

When I have now conducted my pupil so far; have informed him of what I have done for him, and of the difficulty of his situation; and have resigned my authority into his hands; he is so sensible of the dangers to which he is exposed, and of the tender sollicitude with which I have watched over him, that he still wishes to continue under my direction. With some feigned difficulty I again resume the reins. My authority is now established. I may command obedience; but I endeavour to guard against the necessity of using it in this manner.

To preserve him from indulging in licentious pleasures, I let him know that nature has designed us for living in a state of marriage, and invite him to go in search of a female companion. I will describe to him the woman whom he is to consider as worthy of his attachment in the most flattering colours. I will array her in such charms, that his heart shall be hers before he has once seen her. I will even name her: her name shall be Sophia. His attachment to this imaginary fair one will preserve him from all the allurements of unlawful love. Besides, I take care to inspire him with such reverence for himself,—that, notwithstanding all the fury of his desires, he will not condescend to pursue the enjoyments of debauchery. And though I may now sometimes entrust him to his own care, and not seek to confine him always under my eye; yet still I will be cautious to watch over his conduct with careful circumspection.

But as Emilius is to be shortly introduced to his Sophia, it may perhaps be proper for us to inquire into her character, and in what manner she has been brought up.

There is a natural difference between the two sexes. ⁴⁰ The difference in the structure of their bodies shows characters of the two sexes. them to be defined by nature for different purposes in life, and must necessarily occasion a distinction between their characters. It is vain to ask which of them merits the pre-eminence: each of them is peculiarly fitted to answer the views of nature. Woman is naturally weak and timid, man strong and courageous; the one is a dependent, the other a protector. As the guardian of her virtue, and a restraint on her desires, woman is armed with native modesty. Reason is the guide and governor of man. When a man and a woman

Education man are united by conjugal vows, a violation of those vows is evidently more criminal in the woman than in the man. The wife ought to be answerable for the genuineness of the offspring with which she has been entrusted by nature. It is no doubt barbarous and wicked for the husband to defraud his wife of the only reward which she can receive for the severe duties of her sex: but the guilt of the faithless wife is still more atrocious; and the consequences of her infidelity are still more unhappy.

But if nature has established an original distinction between the characters of the two sexes; has formed them for different purposes, and assigned them different duties; it must follow, that the education of the one sex ought to be conducted in a manner different from that of the other. The abilities common to the two sexes are not equally divided between them; but if that share which nature has distributed to woman be scantier than what she has bestowed on man, yet the deficiency is more than compensated by the qualities peculiar to the female. When the woman confines herself to assert her proper rights, she has always the advantage over man; when she would usurp those of the other sex, the advantage is then invariably against her.

But we require not that woman should be brought up in ignorance. Let us consider the delicacy of her sex, and the duties which she is destined to perform; and to these we may accommodate the education which we bestow upon her. While boys like whatever is attended with motion and noise, girls are fond of such decorations as please the eye. Dolls are the favourite plaything of the sex in their infant years. This is an original taste, of the existence of which we have the plainest evidence. All therefore that we ought to do is, to trace and bring it under proper regulation. Allow the girl to decorate her baby in whatever manner she pleases; while employed about that, she will acquire such skill and dexterity in those arts which are peculiar to her sex, that with scarce any difficulty she will acquire needle-work, embroidery, and the art of working lace. Her improvements may even be extended as far as designing, an art somewhat connected with taste in dress; but there is no reason that their skill in this art should be carried farther than to the drawing of foliage, fruits, flowers, drapery, and such parts of the art as bear some relation to dress. Always assign reasons for the employment which you give to young girls, but be sure you keep them constantly busy. They ought to be accustomed to laborious industry, as well as to bear the abridgment of their liberty. Use every art to prevent their work from becoming disagreeable to them. For that purpose, let the mother be careful to make herself agreeable. A girl who loves her mother or her aunt, will work cheerfully by them all day; while she to whom her mother is not dearer than all the world besides, seldom turns out well. Never suffer girls, even at their diversions, to be entirely free from restraint, nor allow them to run from one amusement to another. If you now and then detect your daughter using a little artifice to excuse herself from obedience, reflect that artifice is, in a certain degree, natural to the fair sex; and as every natural inclination, when not abused, is upright and good, why should it not be cultivated? In order to

give girls proper notions of dress, let them be taught to consider splendor and elegance of dress as designed only to conceal the natural defects of the person; and to regard it as the noblest triumph, the highest praise, of beauty, to shine with unborrowed lustre in the simplest attire. Forbid not young women to acquire those arts which have a tendency to render them agreeable. Why refuse them the indulgence of learning to dance, to sing, and to study such other accomplishments as afterwards enable them to entertain their husbands? Girls are more disposed to prattle, and at an earlier age, than boys. We may now and then find it necessary to restrain their volubility. But the proper question to them on such occasions is not, as to boys, *Of what use is this?* but, *What efforts will this produce?* At this early period, when they are yet strangers to the distinction between good and evil, and therefore unable to form a just judgment concerning any person's conduct, we ought to restrain them carefully from saying what may be disagreeable to those with whom they converse.

Girls are no less incapable than boys of forming distinct notions of religion at an early age. Yet, and even far that very reason, religious instruction should be communicated to them much sooner than to the youth of the other sex. Were we to wait the period when their mental faculties arrive at maturity, we might perhaps lose the happiest time, from our inability to make a right distinction. Since a woman's conduct is subject to public opinion, her belief ought therefore to depend, not on reason, but on authority. Every girl ought to follow the religion of her mother, every married woman that of her husband. They cannot derive a rule of faith from their own inquiry. Let us therefore seek, not so much to instruct them in the reasons of our belief, as to give them clear distinct notions of those articles which we require them to believe. Be more careful to instruct her in those doctrines which have a connection with morality, than in those mysterious articles which we are required to believe, though we cannot comprehend them.

Such are the principles on which the education of Emilius's unknown mistress has been conducted.

[Notwithstanding the merit of that part of this treatise in which the author entertains us with the courtship between his Emilius and Sophia, it does not appear to be so intimately connected with the subject of education as to render it proper for us to present our readers with a view of it. We therefore pass over the courtship, to give a view of our author's sentiments concerning the advantages to be derived from travelling, and the manner in which it ought to be directed.]

When Emilius has formed a firm attachment to So-⁴²Emilius at-
phia, and by his assiduities has been so fortunate as to be-^{such to a}
gain her affections, his great wish now is, to be united ^{mistress.}
with her in the bonds of marriage. But as he is still young, is but imperfectly acquainted with the nature of those duties incumbent on him as a member of a particular society, and is even ignorant of the nature of laws and government, I must separate him from his Sophia, and carry him to gain a knowledge of these things, and of the character and circumstances of mankind, in various countries, and under various forms of civil government, by travelling. Much has been said

Education. concerning the propriety of sending young people to travel, in order to complete their education. The multiplicity of books is unfavourable to real knowledge. We read with avidity, and think that by reading we render ourselves prodigiously wise. But we impose on ourselves: the knowledge which we acquire from books is a false species of knowledge, that can never render us truly wise.

To obtain real knowledge, you must observe nature with your own eyes, and study mankind. But to gain this knowledge by travelling, it is not necessary that we should traverse the universe. Whoever has seen ten Frenchmen, has beheld them all; and whoever has surveyed and compared the circumstances and manners of ten different nations, may be said to know mankind.

To pretend that no advantages may be derived from travelling, because some of those who travel return home without having gained much real improvement, would be highly unreasonable. Young people who have had a bad education, and are sent on their travels without any person to direct or superintend their conduct, cannot be expected to improve by visiting foreign countries. But they whom nature has adorned with virtuous dispositions, who have been so happy as to receive a good education, and go abroad with a real design of improvement, cannot but return with an increase of virtue and wisdom. In this manner shall *Emilius* conduct his travels. To induce him to improve in the most attentive manner that time which he should spend in travelling, I would let him know, that as he had now attained an age at which it might be proper for him to form some determination with regard to the plan of his future life, he ought therefore to look abroad into the world, to view the various orders in society, to examine the various circumstances of mankind, under different forms of government, and in different parts of the globe; and to choose his country, his station, and his profession. With these views should *Emilius* set out on his travels; and with these views, in the course of our travels, we should inquire into the origin of society and government, into the nature of those principles by means of which men are united in a social state, into the various circumstances which have given rise to so many different forms of government, and into the necessary relation between government and manners. Our stay in the great towns should be but short: for as in them corruption of manners has risen to a great height, and dissipation reigns, a long stay in any great town might be fatal to the virtuous dispositions of *Emilius*. Yet his attachment to *Sophia* would alone be sufficient to save him from the dangers to which his virtue is exposed. A young man must either be in love, or be a debauchee. Instances may be pointed out in which virtue has been preserved without the aid of love; but to such instances I can give little credit.

44
Return
from his
travels, and
marriage.

Emilius, however, may now return to his *Sophia*. His understanding is now much more enlightened than when he set out on his travels. He is now acquainted with several forms of government, their advantages and defects, with the characters of several different nations, and with the effects which difference in circumstances may be expected to produce on the characters of nations. He has even been so fortunate as to get acquainted with some persons of merit in each of the

countries which he has visited. With these advantages gained, and with affection unchanged and unabated, he returns to his *Sophia*. After having made him acquainted with the languages, the natural history, the government, the arts, customs, and manners, of so many countries, *Emilius* eagerly informs me that the period which we had destined for our travels is now expired. I ask, What are then his purposes for life? He replies, that he is satisfied with the circumstances in which nature has placed him, and with my endeavours to render him independent on fortune, and wishes only for his *Sophia* to be happy. After giving him a few advices for the regulation of his conduct in life, I conduct him to his *Sophia*, and behold him united with her in marriage. I behold him happy; with affectionate gratitude he blesses me as the author of his happiness; and I thus receive the reward of all the pains with which I have conducted his education.

Such are the outlines of the system of education proposed by this singular and original genius. For originality of thought, affecting sentiment, enchanting description, and bold vehement eloquence, this book is one of the noblest pieces of composition, not only in the French language, but even in the whole compass of ancient and modern literature. The irregularity of his method, however, renders it a very difficult task to give an abridged view of his work. He conducts his pupil, indeed, from infancy to manhood: But instead of being barely a system of education, his work is besides a treasure of moral and philosophical knowledge. He has chosen a path, and follows it from the bottom to the summit of the hill: yet whenever a flower appears on the right or left hand, he eagerly steps aside to pluck it; and sometimes, when he has once stepped aside, a new object catches his eye and seduces him still farther. Still, however, he returns. His observations are in many places loosely thrown together, and many things are introduced, the want of which would by no means have injured either the unity or the regularity of his work. If we attempt to review the principles on which he proceeds in reprobating the prevalent modes of education, and pointing out a new course, his primary and leading one seems to be, that we ought to watch and second the designs of nature, without anticipating her. As the tree blossoms, the flowers blow and the fruit ripens each at a certain period; so there is a time fixed in the order of nature for the sensitive, another for the intellectual, and another for the moral powers of man to display themselves. We in vain attempt to teach children to reason concerning truth and falsehood, concerning right and wrong, before the proper period arrive: We only confound their notions of things, and load their memories with words without meaning; and thus prevent both their reasoning and moral powers from attaining that strength and acuteness of which they are naturally capable. He attempts to trace the progress of nature, and to mark in what manner she gradually raises the human mind to the full use of all its faculties. Upon the observations which he has made in tracing the gradual progress of the powers of the human mind towards maturity, his system is founded.

As it is impossible to communicate to the blind any just ideas of colours, or to the deaf of sounds; so it must be acknowledged, that we cannot possibly communicate

Education. communicate to children ideas which they have not faculties to comprehend. If they are, for a certain period of life, merely sensitive animals, it must be folly to treat them during that period as rational and moral beings. But is it a truth that they are, during any part of life, guided solely by instinct, and capable only of sensation? Or, how long is the duration of that period? Has nature unkindly left them to be, till the age of twelve, the prey of appetite and passion? So far are the facts of which we have had occasion to take notice, concerning the history of infancy and childhood, from leading to such a conclusion, that to us it appears undeniable that children begin to reason very soon after their entrance into life. When the material world first opens on their senses, they are ignorant of the qualities and relations of surrounding objects; they know not, for instance, whether the candle which they look at be near or at a distance; whether the fire with which they are agreeably warmed may also affect them with a painful sensation. But they remain not long in this state of absolute ignorance. They soon appear to have acquired some ideas of the qualities and relative situation of bodies. They cannot, however, acquire such ideas, without exerting reasoning powers in a certain degree. Appearances must be compared, and inferences drawn, before knowledge can be gained. It is not sensation alone which informs us of the relative distances of bodies; nor can sensation alone teach us, that the same effects which we have formerly observed will be again produced by the same cause.

But if children appear capable of reasoning at a very early period, they appear also to be at a very early period subject to the influence of the passions: they are angry or pleased, merry or sad, friends or enemies, even while they hang at the breast; instead of being selfish, they are naturally liberal and social. And if we observe them with candid attention, we will find that the passions do not display themselves sooner than the moral sense. As nature has wisely ordered, that we should not see, and hear, and feel, without being able to compare and draw inferences from our perceptions; so it is a no less certain and evident law of nature, that the passions no sooner begin to agitate the human breast, than we become able to distinguish the beauty and the deformity of virtue and vice. The child is not only capable of gratitude and attachment to the person who treats him with kindness; he is also capable of distinguishing between gratitude and ingratitude, and of viewing each with proper sentiments. He cries when you refuse to gratify his desires; but he boldly insists that he is injured when you use him cruelly or unjustly. It is indeed impossible to attend to the conduct of children during infancy, without being convinced that they are, even then, capable of moral distinctions. So little are they acquainted with artificial language, that we and they do not then well understand each other. But view their actions; consider those signs by which nature has taught them to express themselves. Our limbs, our features, and our senses, are not gradually and by piecemeal bestowed as we advance towards maturity; the infant body comes not into the world mutilated or defective: why then, in point of mental abilities, should we be for a while brutes, without becoming rational and moral beings till the fulness of time be accomplished? All the differences between the

Education. phenomena of manhood and those of infancy and childhood may be accounted for, if we only reflect, that when children come into the world, they are totally unacquainted with all the objects around them; with the appearances of nature, and the institutions of society; that they are sent into the world in a feeble state, in order that the helplessness occasioned by their ignorance may attract the notice and gain the assistance of those who are able to help them; and that they attain not full strength in the powers either of mind or body, nor a sufficient acquaintance with nature, with artificial language, and with the arts and institutions of society, till they arrive at manhood.

Even Rousseau, notwithstanding the art with which he lays down his system, cannot avoid acknowledging indirectly, on several occasions, that our social dispositions, our rational and our moral powers, display themselves at an earlier period than that at which he wishes us to begin the cultivation of them.

But though the great outlines of his system be merely theory, unsupported by facts, nay plainly contradictory to facts; yet his observations on the impropriety or absurdity of the prevalent modes of education are almost always just, and many of the particular directions which he gives for the conducting of education are very judicious. He is often fanciful, and often deviates from the common road, only to show that he is able to walk in a separate path. Yet why should he be opposed with so much virulence, or branded with so many reproachful epithets? His views are liberal and extensive: his heart seems to have glowed with benevolence: his book contains much observation of human actions; displays an intimate acquaintance with the motives which sway the human heart; and if not a perfect system for education, is yet superior to what any other writers had before done upon the subject. It is surely true, that we ourselves often call forth evil passions in the breasts of children, and impress them with bad habits: it is no less true that we put books in their hands, and load their memory with words, when we ought rather to direct their attention to things, to the phenomena of nature, and the simplest arts of life. The form in which he has chosen to communicate his sentiments on the subject of education renders the perusal of it more pleasing, and his precepts more plain, than they would otherwise have been: it is nearly that dramatic form with which we are so much delighted in some of the noblest compositions of the ancients.

After viewing the public establishments for education which existed in some of the most renowned states of antiquity; and after listening to the sentiments of the experienced Quintilian, the learned Milton, the judicious Locke, and the bold fanciful Rousseau, on this interesting subject; it may now be proper to lay before the reader our own sentiments concerning the education of youth under a few distinct heads.

Indeed, if we were disposed to give abridgments of all the books which have been written on the subject of education, or even to hint at all the various modes which have been recommended by teachers or theorists, we might swell this article to an amazing size: Nay, were we only to take notice of the many elegant and sensible writers who have of late endeavoured to call the attention of the public to this subject, we might extend it to an inmoderate length. A Kames, a Priestley,

Education. Icy, a Knox, a Madame de Sillery, and a Berquin, might well attract and fix our attention. But as, among such a crowd of writers, every thing advanced by each cannot be original; and even of those things which are original only a certain, and that perhaps even a moderate, proportion, can be just and judicious; and as they often either borrow from one another, or at least agree in a very friendly manner, though in some things they profess a determined hostility; therefore we shall content ourselves with having taken notice of four of the most respectable writers on the subject.

In presenting to our readers the result of our own observations and reflections, we shall throw our thoughts nearly under the following heads. The management of children from their birth till they attain the age of five or six; from that period till the age of puberty; and from that age till manhood; private and public education; religion and morals; the languages; natural philosophy; the education of people of rank and fortune; education of persons designed for a mercantile employment, and for the other humbler occupations in active life not particularly connected with literature; education of the female sex; foreign travel; knowledge of the world; and entrance into active life. We do not pretend to be able to include under these heads every thing worthy of notice in the subject of education: but under these we will be able to comprehend almost every thing of importance that has occurred to us on the subject.

I. *On the Management of Infants from the Time of their Birth till they attain the Age of five or six.*

THE young of no other animal comes into the world in so helpless a state, or continues so long to need assistance, as that of the human species. The calf, the lamb, and the kid, are vigorous and lively at the instant of their birth; require only, for a very short period, nourishment and protection from their respective dams; and soon attain such degrees of strength and activity as to become entirely independent. The infancy of the oviparous animals is not of longer continuance: And, indeed, whatever department of the animal world we may choose to survey, we will find that no species is subject to the same severe laws as man during the first period of life.

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Man compared to other animals, in respect to their helplessness of infancy.

Yet the character and the views of man are so very different from those of the other animals, that a more careful attention to these may perhaps induce us to regard this seeming severity rather as an instance of the peculiar kindness of the Author of nature. From every observation which has been hitherto made on the powers and operations of the inferior animals, we are led to consider them as guided and actuated chiefly, if not solely, by instinct, appetite, and sensation: their views extend not beyond the present moment; nor do they acquire new knowledge or prudence as they advance in life. But the character of the human race is much more exalted. We have all powers and organs of sensation, instincts and appetites; but these are the most ignoble parts of our nature: our rational faculties and moral powers elevate us above the brutes, and advance us to an alliance with superior beings. These rational faculties and moral powers render us capable of social life, of artificial language, of art, of science, and of religion. Now, were one of the species to come into the world full grown, possessed of that bodily strength and vigour

which distinguishes manhood, his ignorance would still render him inadequate to the duties of life; nay, would even render him unable to procure means for his subsistence: while his manly appearance would deprive him of the compassion and benevolent assistance of others; and his strength and vigour would also render him less docile and obedient than is necessary, in order that he may receive instruction in the duties and arts of life. Again, were the period of infancy as short to the human species as to the other animals; were we to be no longer subjected to a parent's authority, or protected by his care, than the bird or the quadruped; we should be exposed to the dangers and difficulties of the world before we had acquired sufficient knowledge or prudence to conduct us through them, before we had gained any acquaintance with the ordinary phenomena of nature, or were able to use the language or practise the arts of men in a social state.

Since, then, it is by the benevolence of nature that we are feeble and helpless at our entrance into life, and that our progress towards maturity is slow and gradual; since nature has destined us to be for a considerable time under the care and authority of our parents; and since the manner in which we are managed during that early part of life has so important an influence on our future character and conduct: it is therefore incumbent on parents to direct that tenderness, which they naturally feel for their offspring, in such a manner as to second the views of nature.

When children come into the world, instinct directs them to receive nourishment from the breast, and to claim attention to their pains and wants by crying. We attend to their signs, and strive to render them as easy as we can. They are washed, clothed with such garments as we think most suitable, and suckled either by their mother or by some other woman who is considered as proper for the purpose. The absurd mode of swaddling up infants in such a manner as to confine them almost from all motion, and leave scarce a limb at liberty, which has been so often exclaimed against and represented as highly injurious to the symmetry and vigour of the human frame, is now almost entirely laid aside; and therefore we need not raise our voice against it. Still, however, there are certainly too many pins and bandages used in the dresses of infants: these are unfavourable to the circulation of the blood, impede the growth, and often occasion those tears and that peevishness which we rashly attribute to the natural ill-humour of the poor creatures. Their dresses ought to be loose and cool, so as to press hard on no joint, no vein nor muscle; and to leave every limb at liberty. If too heavy and close, it may occasion too copious a perspiration, and at the same time confine the matter perspired on the surface of the skin; than which nothing can be more prejudicial to the health of the child. It may also, however, be too thin and cool: for as moderate warmth is necessary to the vegetation of plants; so it is no less necessary for promoting the growth of animals: and, therefore, though the dresses of infants ought to be loose and easy, yet still it should be moderately warm.

It is common for mothers in affluent or even in comfortable circumstances, to forego the pleasure of nursing their own children, that they may avoid the fatigues with which it is attended. This practice has long prevailed in various ages and among various nations;

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Education: tions : it has been often reprobated with all the warmth of passion, and all the vehemence of eloquence, as dishonourable, inhuman, contradictory to the designs of nature, and destructive of natural affection: yet still it prevails; fathers and mothers are still equally deaf to the voice of nature and the declamations of philosophers. Indeed, in a luxurious age, such a practice may be naturally expected to prevail. In such an age, they who are possessed of opulence generally persuade themselves, that, to be happy, is to spend their time wholly amid diversions and amusements, without descending to useful industry, or troubling themselves about the ordinary duties of life. Influenced by such notions, they think it proper for them to manage their family affairs, and to nurse and educate their children, by proxy; nay, to do for themselves nothing that another can perform for them. It is vain to make a furious opposition to these absurd notions; the false views of happiness, the pride and the indolence produced by luxury, will still be too powerful for us. We must not hope to persuade the mother, that to receive the caresses, to behold the smiles, and to mark the bodily and mental powers of her child in their gradual progress towards maturity, would be more than a sufficient compensation for all the fatigues which she would undergo in nursing and watching over him in his infant years. We need not mention, that the mutual affection between a mother and her child, which is partly the effect of instinct, depends also, in no inconsiderable degree, on the child's spending the period of infancy in its mother's arms; and that when she substitutes another in her place, the child naturally transfers its affection to the person who performs it the duties of a mother. We need not urge these, nor the various other reasons which seem to recommend to every mother the province of suckling her own children, and watching over their infant years; for we will either not be heard, or be listened to with contempt. Yet we may venture to suggest, that if the infant must be committed to a stranger, some degree of prudence may be employed in selecting the person to whom he is to be entrusted. Her health, her temper, and her manner of speaking, must be attended to. A number of other qualifications are also to be required in a nurse: but it is rather the business of the physician to give directions with regard to these. If her habit of body be any way unhealthy, the constitution of the infant that sucks her milk cannot but be injured: if her temper be rough or peevish, the helpless child subjected to her power will be often harshly treated; its spirit will be broken, and its temper soured: if her pronunciation be inarticulate or too rapid, the child may acquire a bad habit when it first begins to exert its vocal organs, which will not be easily corrected.

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Influence of
treatment
in infancy
on the abi-
lities and
dispositions.

In the milder seasons of the year, infants ought to be frequently carried abroad. Not only is the open air favourable to health, but the freshness, the beauty, the variety, and the lively colours of the scenes of nature, have the happiest effects on the temper, and have even a tendency to enliven and invigorate the powers of the mind. At this period, the faculties of the understanding and the dispositions of the heart generally acquire that particular bias, and those distinguishing features, which characterize the individual during the future part of his life, as quick or dull,

mild or passionate; and which, though they be generally attributed to the original conformation of the mind by the hand of nature, yet are owing rather to the circumstances in which we are placed, and the manner in which we are treated, during the first part of life.

When children begin to walk, our fondness disposes us to adopt many expedients to assist them. But these seem to be improper. It is enough for us to watch over them so as to guard them from any danger which they might otherwise incur by their first attempts to move about. Those who advise us not to be too anxious to preserve children from those slight hurts to which they are exposed from their disposition to activity, before they have acquired sufficient strength or caution, certainly give a judicious piece of advice which ought to be listened to. By being too attentive to them, we teach them to be careless of themselves; by seeming to regard every little accident which befalls them as a most dreadful calamity, we inspire them with timidity, and prevent them from acquiring manly fortitude. When children begin to lip out a few words or syllables, the pleasure which we feel at hearing them aim at the use of our language, disposes us to listen to them with such attention as to relieve them from the necessity of learning an open distinct articulation. Thus we teach them to express themselves in a rapid, indistinct, and hesitating manner, which we often find it difficult, sometimes even impossible, to correct, when they are farther advanced. Would we teach them a plain distinct articulation, we ought not only to speak plainly and distinctly in their presence, but also to disregard their questions and requests, if not expressed with all the openness and distinctness of pronunciation of which they are capable.

Man is naturally an imitative animal. Scarce any of our natural dispositions is displayed at an earlier period than our disposition to imitation. Childrens first amusements are dramatic performances, imitative of the arts and actions of men. This is one proof among others, that even in infancy our reasoning faculties begin to display themselves; for we cannot agree with some philosophers, that children are actuated and guided solely by instinct in their attempts at imitation.

However that be, the happiest use might be made of this principle which discovers itself so early in the infant mind. Whatever you wish the child to acquire, do in his presence in such a manner as to tempt him to imitate you. Thus, without sousing his mind by restraint during this gay innocent period of life, you may begin even now to cultivate his natural powers. Were it impossible at this time to communicate any instruction to the boy, without banishing that sprightly gaiety which naturally distinguishes this happy age, it would be best to think only how he might lose his time in the least disadvantageous manner. But this is far from being necessary. Even now the little creature is disposed to imitation, is capable of emulation, and feels a desire to please those whose kindness has gained his affection. Even now his sentiments and conduct may be influenced by rewards when prudently bestowed, and by punishments when judiciously inflicted. Why then should we hesitate to govern him by

Education by the same principles, by which the laws of God and society assert their influence on our own sentiments and conduct? Indeed, the imprudent manner in which children are too generally managed at this early period, would almost tempt us to think it impossible to instruct them, as yet, without injuring both their abilities and dispositions. But this is owing solely to the carelessness, stupidity, or capricious conduct of those under whose care they are placed.

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Obedience
whether,
and when,
to be ex-
pected.

Is implicit obedience to be exacted of children? and at what period of life should we begin to enforce it? As children appear to be capable both of reasoning and of moral distinctions at a very early age; and as they are so weak, so inexperienced, so ignorant of the powers of surrounding bodies, and of the language, institutions, and arts of men, as to be incapable of supporting or conducting themselves without direction or assistance; it seems therefore proper that they be required even to submit to authority. To the necessity of nature both they and we must on many occasions submit. But if the will of a parent or tutor be always found scarce less unalterable than the necessity of nature, it will always meet with the same respectful submissive resignation. It may not perhaps be always proper to explain to children the reasons for which we require their obedience: because, as the range of their ideas is much less extensive than ours; as they do not well understand our language, or comprehend our modes of reasoning; and as they are now and then under the influence of passion and caprice, as well as people who are farther advanced in life; we are therefore likely to fail in making them comprehend our reasons, or in convincing them that they are well-grounded. And as it is proper to exact obedience of children; so we should begin to require it as soon as they become capable of any considerable degree of activity. Yet we must not confine them like slaves, without allowing them to speak, to look, or to move, but as we give the word. By such treatment we could expect only to render them peevish and capricious. It will be enough, at first, if we let them know that obedience is to be exacted; and if we restrain them only where, if left at liberty, they would be exposed to imminent danger.

If then, at so early a time of life as before the age of five or six, it is possible to render children obedient, and to communicate to them instruction; what arts, or what learning, ought we to teach them at that period? To give a proper answer to this question, is no easy matter. It seems at first difficult to determine, whether we ought yet to initiate them in letters. But as their apprehension is now quick, and their memory pretty tenacious, there cannot be a more favourable time for this very purpose. As soon as they are capable of a distinct articulation, and seem to possess any power of attention, we may with the greatest propriety begin to teach them the alphabet. The most artful, alluring methods may be adopted to render the horn-book agreeable; or we may use the voice of authority, and command attention for a few minutes; but no harshness, no severity, and scarce any restraint. At the same time, it will be proper to allow the little creatures to run much about in the open air, to exercise their limbs, and to cultivate those social dispositions which already begin to appear, by playing with their equals.

Such are the thoughts which have suggested them. *Education* selves to us concerning the management of children in mere infancy. What an amiable little creature would the boy or girl be, who were brought up in a manner not inconsistent with the spirit of these few hints? Behold him healthy and vigorous, mild, sprightly, and cheerful: He is submissive and docile, yet not dull or timid; he appears capable of love, of pity, and of gratitude. His mind is hitherto, however, almost wholly uninformed: he is acquainted but with a few of the objects around him; and knows but little of the language, manners, and institutions of men: but he feels the impulse of an ardent curiosity, and all the powers of his mind are alive and active.

II. On the Management of Children between the Age of five or six and the Age of puberty.

At this period it may be proper, not only to exact obedience, and to call the child's attention for a few minutes now and then to those things of which the knowledge is likely to be afterwards useful to him; but we may now venture to require of him a regular steady application, during a certain portion of his time, to such things as we wish him to learn. Before this time it would have been wrong to confine his attention to any particular task. The attempt could have produced no other effect than to destroy his natural gaiety and cheerfulness, to blunt the native quickness of his powers of apprehension, and to render hateful that which you wished him to acquire. Now, however, the case is somewhat different: The child is not yet sensible of the advantages which he may derive from learning to read, for instance; or even though he were able to force all the advantages which he will obtain by skill in the art of reading through the course of life; yet is it the character of human nature, at every stage of life, to be so much influenced by present objects in preference to future views, that the sense of its utility alone would not be sufficient to induce him to apply to it. Even at the age of 12, of 20, of 50; nay, in extreme old age, when reason is become very perspicacious, and the passions are mortified; still we are unable to regulate our conduct solely by views of utility. Nothing could be more absurd, therefore, than to permit the child to spend his time in foolish tricks, or in idleness, till views of utility should prompt him to spend it in a different manner. No; let us begin early to habituate him to application and to the industrious exertion of his powers. By endowing him with powers of activity and apprehension, and rendering him capable of pursuing with a steady eye those objects which attract his desires, nature plainly points out to us in what manner we ought to cultivate his earlier years. Besides, we can command his obedience, we can awaken his curiosity, we can rouse his emulation, we can gain his affection, we can call forth his natural disposition to imitation, and we can influence his mind by the hope of reward and the fear of punishment. When we have so many means of establishing our authority over the mind of the boy without tyranny or usurpation; it cannot surely be difficult, if we are capable of any moderation and prudence, to cultivate his powers by making him begin at this period to give regular application to something that may afterwards be useful.

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A know-
ledge of
words and
of things
must be
learned at the
same time.

And if the boy must now begin to dedicate some portion of his time regularly to a certain task, what task will be most suitable? Even that to which children are usually first required to apply; continue teaching him to read. Be not afraid that his abilities will suffer from an attention to books at so early an age. Say not that it is folly to teach him words before he have gained a knowledge of things. It is necessary, it is the design of nature, that he should be employed in acquiring a knowledge of things, and gaining an acquaintance with the vocal and written signs by which we denote them, at the same time. These are intimately connected; the one leads to the other. When you view any object, you attempt to give it a name, or seek to learn the name by which men have agreed to distinguish it: in the same manner, when the names of substances or of qualities are communicated to us, we are desirous of knowing what they signify. At the same time, so imperfect is the knowledge of nature which children can acquire from their own unassisted observation, that they must have frequent recourse to our assistance before they can form any distinct notions of those objects and scenes which they behold. Indeed language cannot be taught, without teaching that it is merely a system of signs, and explaining what each particular sign is designed to signify. If, therefore, language is not only necessary for facilitating the mutual intercourse of men, but is even useful for enabling us to obtain some knowledge of external nature, and if the knowledge of language has a natural tendency to advance our knowledge of things; to acquaint ourselves with it must therefore be regarded as an object of the highest importance: it must also be regarded as one of the first objects to which we ought to direct the attention of children. But the very same reasons which prove the propriety of making children acquainted with those artificial vocal signs which we use to express our ideas of things, prove also the propriety of teaching them those other signs by which we express these in writing. It is possible indeed, nay it frequently happens, that we attempt to instruct children in language in so improper a manner as to confound their notions of things, and to prevent their intellectual powers from making that improvement of which they are naturally capable; but it is also possible to initiate them in the art of reading, and in the knowledge of language, with better auspices and happier effects. The knowledge of language may be considered as the key by which we obtain access to all the stores of natural and moral knowledge.

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Confinement, how
far proper

Though we now agree to confine our pupil to a certain task, and have determined that his first task shall be to learn to read; yet we do not mean to require that he be confined to this task during the greatest part of the day, or that his attention be seriously directed to no other object. To subject him to too severe restraint would produce the most unfavourable effects on his genius, his temper, and his dispositions. It is in consequence of the injudicious management of children, while they are sometimes suffered to run riot, and at other times cruelly confined like prisoners or slaves; it is in consequence of this, that we behold so many instances of peevishness, caprice, and invincible aversion to all serious application at this period of life. But were a due medium observed, were restraint duly tempered

Education.

with liberty and indulgence, nothing would be more easy than to dispose children to cheerful obedience, and to communicate to them instruction at this age. That part of their time which they are left to enjoy at liberty, they naturally dedicate to their little sports. The favourite sports of boys are generally active; those of girls, sedentary. Of each we may take advantage, to prepare them for the future employments of life. However, neither are the amusements of boys invariably active, nor those of girls always sedentary; for, as yet, the manners and dispositions of the two sexes are distinguished rather by habit or accident than by nature. The disposition to activity which characterizes children, is no less favourable to health than to their improvement in knowledge and prudence; their active sports have a tendency to promote their growth and add new vigour to their limbs. Perhaps, even at this time, children might be enticed to learn the elements of natural philosophy and natural history amid their amusements and sports. Birds, butterflies, dogs, and other animals, are now favourite objects of their care; their curiosity is powerfully roused by the appearance of any strange object; and many of the simplest experiments of natural philosophy are so pleasing, that they cannot fail to attract the attention even of those who are least under the influence of curiosity. Yet it would be improper to insist on their attention to these things as a task: if we can make them regard them as amusements, it will be well; if not, we must defer them to some happier season. They might also, by proper management, be led to acquire some skill in the arts. They build mimic houses, and fill them with suitable furniture; they construct little boats, and sail them; they will fence in little gardens, and cultivate them; and we even see them imitate all the labours of the husbandman. Such is the pleasure which man naturally feels in exerting his powers, and in acting with design. Let us encourage this disposition. These are the most suitable amusements in which they can engage.

As the boy's attention to literary objects is still suspended to be continued, he will soon be able to read with some correctness and facility. It becomes an object of importance, and of no small difficulty, to determine what books are to be put into his hands, and in what manner his literary education is to be conducted. After the child is made acquainted with the names and powers of the letters, with their combination into syllables, and with the combination of these again into words, so that he can read with tolerable facility; it will be proper that the pieces of reading which are put into his hands be such as are descriptive of the actions of men, of the scenes of external nature, and of the forms and characters of animals. With these he is already in some degree acquainted: these are the objects of his daily attention; beyond them the range of his ideas does not yet extend; and therefore other subjects will be likely to render his task disagreeable to him. Besides, our present object is to teach him words: in order to teach him words, we must let him know their signification; but till he have acquired a very considerable knowledge of language, till he have gained a rich fund of simple ideas, it will be impossible for him to read or to hear with understanding on any other subject but these. And let us not as yet be particularly

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What books
most proper.

Educationally anxious to communicate to him religious or moral instruction, otherwise than by our example, and by causing him to act in such a manner as we think most proper. Our great business at present is, to make him acquainted with our language, and to teach him in what manner we use it to express our ideas. By his own observation, and by our instruction, he will soon become capable of comprehending all that we wish to communicate : But let us not be too hasty ; the boy cannot long view the actions of mankind, and observe the economy of the animal and the vegetable world, without becoming capable of receiving both religious and moral instruction when judiciously communicated.

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Writing. As soon as the pupil can read and spell with tolerable facility, and has acquired sufficient strength of arm and fingers to hold a pen, it may be proper to initiate him in the art of writing. If this art is not made disagreeable by the manner in which his application to it is required, he will learn it without difficulty. Children's natural disposition to imitate, particularly whatever depends on manual operation, renders this art peculiarly easy and pleasing to them when they are not harshly forced to apply to it, nor suffered to get into a habit of performing their task with haste and negligence.

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Restraint. It requires indeed the most cautious prudence, the nicest delicacy, and the most artful address, to prevail with children to give a cheerful and attentive application to any appointed task. If you are too stern and rigid in enforcing application, you may seemingly obtain your object : the child sits motionless, and fixes his eye on his book or copy ; but his attention you cannot command ; his mind is beyond your reach, and can elude your tyranny ; it wanders from the present objects, and flies with pleasure to those scenes and objects in which it has found delight. Thus you are disappointed of your purpose ; and, besides, inspire the child with such aversion both to you and to those objects to which you wish him to apply, that perhaps at no future period will he view learning otherwise than with disgust.

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Gentleness. Again, gentleness, and the arts of insinuation, will not always be successful. If you permit the child to apply just when he pleases ; if you listen readily to all his pretences and excuses ; in short, if you seem to consider learning as a matter not of the highest importance, and treat him with kindness while he pays but little attention and makes but slow progress ; the consequences of your behaving to him in this manner will be scarce less unfavourable than those which attend imprudent and unreasonable severity. It is, however, scarce possible to give particular directions how to treat children so as to allude them to learning, and at the same time to command their serious attention. But the prudent and affectionate parent and the judicious tutor will not be always unsuccessful ; since there are so many circumstances in the condition of children, and so many principles in their nature, which subject them to our will.

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Arithmetic. The principles of arithmetic ought to make a part in the boy's education as soon as his reasoning powers appear to have attained such strength and quickness that he will be able to comprehend them. Arithmetic affords more exercise to the reasoning powers of

the mind than any other of those branches of learning to which we apply in our earlier years : and if the child's attention be directed to it at a proper period, if he be allowed to proceed slowly, and if care be taken to make him comprehend fully the principles upon which each particular operation proceeds, it will contribute much to increase the strength and the acuteness of the powers of his understanding.

Where the learned languages are regarded as an object worthy of attention, the boy is generally initiated in them about this time, or perhaps earlier. We have reserved to a separate head the arguments which occur to us for and against the practice of instructing children in the dead languages ; and shall therefore only observe in this place, that the study of them ought not to engross the learner's attention so entirely as to exclude other parts of education.

From arithmetic our pupil may proceed to the practical branches of the mathematics : Aid in all of these, as well as in every other branch of learning, what you teach him will be best remembered and most thoroughly understood, if you afford him a few opportunities of applying his lessons to real use in life. Geometry and geography are two most important branches of education ; but are often taught in such a manner, that no real benefit is derived from the knowledge of them. The means which Rousseau proposes for initiating young people in these and in several other of the arts and sciences are excellent ; and if judiciously applied, could hardly fail of success.

While boys are engaged in these and in the languages, they may also attend to and cultivate the bodily exercises ; such as dancing, fencing, and horsemanship. Each of these exercises is almost absolutely necessary for one who is designed to have intercourse with the world ; and besides, they have a tendency to render the powers of the body active and vigorous, and even to add new courage and firmness to the mind.

When our pupil has acquired some knowledge of his own and of the learned languages, has gained some skill in the principles of arithmetic and of practical mathematics, and has received some instruction in the principles of morality and religion, or even before this time, it will be proper to begin him to the practice of composition. Themes, versions, and letters, the first exercises in composition which the boy is usually required to perform, none of them seems happily calculated for leading him to increase his knowledge, or to acquire the power of expressing himself with ease and elegance. Without enlarging on the impropriety or absurdity of these exercises, we will venture to propose something different, which we cannot help thinking would conduce more effectually to the end in view. It has been already observed, that the curiosity of children is amazingly eager and active, and that every new object powerfully attracts their regard ; but they cannot view any object without taking notice of its most obvious qualities ; any animal, for instance, without taking notice of its shape, its colour, its seeming mildness or ferocity ; and they are generally pretty ready to give an account of any thing extraordinary which they have observed. How easy then would it be to require them to write down an account of any new object exposed to their observation ?

Education. tion? The task would not be difficult; and every new piece of composition which they presented to us would add so much to their knowledge of nature. We might even require such specimens of their accuracy of observation and skill in language, at times when they enjoyed no opportunities of beholding new or surprising objects; a tree, a flower, a field, a house, an animal, any other simple object, should be the subject of their exercise. After some time, we might require them to describe something more various and complex. They might give an account of several objects placed in a relative situation; as, a stream, and the vale through which it flows; or, a bird, and the manner in which it constructs its nest; or, of one object successively assuming various appearances, as the bud, the flower, the apple. Human actions are daily exposed to their observation, and powerfully attract their attention. By and by, therefore, their task should be to describe some action which had lately passed in their presence. We need not pursue this hint farther; but, if we mistake not, by these means young people might sooner, and much more certainly, be taught to express themselves with ease and correctness in writing, than by any of the exercises which they are at present caused to perform with a view to that. Besides, they would at the same time acquire much more real knowledge. The study of words would then be rendered truly subservient to their acquiring a knowledge of things.

We cannot defend to every particular of that series of education in which we with the boy to be engaged from that period when he first becomes capable of serious application till he reach the age of puberty. It is not necessary that we should, after having given abstracts of what has been offered to the world by so many respectable writers on the subject.

The few hints which we have thrown out will be sufficient to show, in general, in what manner we wish the youth's education to be conducted during this period. Let the parent and the tutor bear in mind, that much depends on their example, with regard to the dispositions and manners of the youth; and let them carefully strive to form him to gentleness, to firmness, to patient industry, and to vigorous courage: let them, if possible, keep him at a distance from that contagion with which the evil example of worthless servants and play-fellows will be likely to infect him. Now is the time for sowing the seeds of piety and virtue: if carefully sown now, they will scarce fail to grow up, and bear fruit in future life.

III. From Puberty to Manhood.

THIS age is every way a very important period in human life. Whether we consider the change which now takes place in the bodily constitution, or the passion which now first begins to agitate the breast, still we must regard this as a critical season to the youth. The business of those to whose care he is still entrusted, is to watch over him so as to prevent the passion for the sex from hurrying him to shameful and vicious indulgence, and from seducing him to habits of frivolity and indolence; to prevent him from becoming either the shameless rake, or the trifling coxcomb. Though so furious is the impulse of that appetite which now fires the bosom and shoots through the veins of the youth, that to restrain him from the

excesses to which it leads can be no easy task; yet if his education has been hitherto conducted with prudence, if he is fond of manly exercises, active, sober, and temperate, and still influenced by modesty and the sense of shame; even this may through the blessing of heaven be accomplished. It is impossible to give better directions than those of Rousseau for this purpose. Let the young man know his situation; set before him in a striking light the virtue which he may practise by restraining appetite, and the frightful fatal vices into which he may be hurried. But trust not to precept, nor to any views which you can lay before him, either of the disgracefulness and the pernicious consequences of vice, or of the dignity and the happy fruits of virtue. Something more must be done. Watch over him with the attention of an Argus; engage him in the most active and fatiguing sports. Carefully keep him at a distance from all such company, and such books, as may suggest to his mind ideas of love, and of the gratification at which it aims. But still all your precautions will not counteract the designs of nature; nor do you wish to oppose her designs. The youth under your care must feel the impulse of desire, and become susceptible of love. Let him then fix his affections on some virtuous young woman. His attachment to her will raise him above debauchery, and teach him to despise brutal pleasures: it will operate as a motive to dispose him to apply to such arts, and to pursue such branches of knowledge, as may be necessary for his farther establishment in the world. The good sense of Rousseau on this head renders it less necessary for us to enlarge on it; especially as we are to treat of some articles separately which regard the management of youth at this period.

IV. Religion and Morals.

In pointing out the general plan of education which appears to us the most proper to be pursued in order to form a virtuous and respectable member of society, we took but slight notice of the important objects of religion and morals. At what period, and in what manner, ought the principles of religion and morality to be instilled into the youthful mind? It has been before observed, that children are capable of reasoning and of moral distinctions even at a very early age. But they cannot then comprehend our reasonings, nor enter into our moral distinctions; because they are strangers to our language, and to the artificial manner in which we arrange our ideas when we express them in conversation or in writing. It follows, then, that as soon as they are sufficiently acquainted with our language, it must be proper to communicate to them the principles and precepts of morality and religion. Long before this time, they are diligent and accurate observers of human actions. For a short period it is merely the external act which they attend to and observe: soon, however, they penetrate farther; conscious themselves of reflection and volition, they regard us also as thinking beings; conscious of benevolent and of unfriendly dispositions, they regard us as acting with design, and as influenced by passion: naturally imitative animals, they are disposed in their conduct to follow the example which we set before them. By our example we may teach them piety and virtue long before it can be proper to offer them religious or moral instruction in a formal manner.

Education.

We cannot presume to determine at what particular period children ought to be first informed of their relations to God and to society, and of the duties incumbent on them in consequence of those relations. That period will be different to different children, according to the pains which have been taken, and the means which have been employed, in cultivating their natural powers. Perhaps even where the most judicious maxims of education have been adopted, and have been pursued with the happiest effects, it cannot be sooner than the age of eight or nine. But even before this period much may be done. Show the child your reverence for religion and virtue; talk in his presence, and in the plainest, simplest terms, though not directly to him, of the existence of God the creator, the preserver, and the governor of the world; speak of the constant dependance of every creature on the gracious care of that Being; mention with ardour the gratitude and obedience which we owe to him as our great parent and best benefactor; next, speak of the mutual relations of society; of the duties of children and parents, of masters and servants, of man to man. At length, when his mind is prepared by such discourses which have passed in his presence without being addressed to him, you may begin to explain to him in a direct manner the leading doctrines of religion. He will now be able to comprehend you, when you address him on that important subject: the truths which you communicate will make a powerful impression on his mind; an impression which neither the corruption and dissipation of the world, nor the force of appetite and passion, will ever be able to efface.

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Habit.

Some writers on this subject have asserted, that youth are incapable of any just ideas of religion till they attain a much more advanced age; and have insisted, that, for this reason, no attempts should be made to communicate to them the articles of our creed in their earlier years. This doctrine, both from its novelty and from its pernicious tendency, has provoked the keenest opposition. It has, however, been opposed rather with keenness than with acuteness or skill. Its opponents seem to have generally allowed that children are incapable of reasoning and of moral distinctions; but they have ascribed wonderful effects to habit. Enrich the memories of children, say they, with the maxims of morality, and with the doctrines of religion; teach them prayers, and call them to engage in all the ordinances of religion. What though they comprehend not the meaning of what they learn? What though they understand not for what purpose you bid them repeat their prayers, nor why you confine them on the Lord's day from their ordinary amusements? Their powers will at length ripen, and they will then see in what they have been employed, and derive the highest advantage from the irksome tasks to which you confined them. You have formed them to habits which they will not be able to lay aside: After this they cannot but be religious at some period of life, even though you have inspired them with a disgust for the exercises of religion. Those good people have also talked of the principle of the *association of ideas*. As no man stands alone in society, say they; so no one idea exists in the mind single and unconnected with others: as you are connected with your parents, your children, your friends, your coun-

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trymen; so the idea of a tree, for instance, is connected with that of the field in which it grows, of the fruit which it bears, and of contiguous, dissimilar, and resembling objects. When any one set of related ideas have been often presented to the mind in connection with one another, the mind at length comes to view them as so intimately united, that any particular one among them never fails to introduce the rest. Revivify the scenes in which you spent your earliest years; the sports and companions of your youth naturally arise to your recollection. Have you applied to the study of the classics with reluctance and constraint, and suffered much from the severity of parents and tutors for your indifference to Greek and Latin? you will, perhaps, never through the course of life see a grammar school, without recollecting your sufferings, nor look on a Virgil or Homer without remembering the stripes and confinement which they once occasioned to you. In the same manner, when religious principles are impressed on the mind in infancy in a proper manner, an happy association is formed which cannot fail to give them a powerful influence on the sentiments and conduct in future life. But if we have advanced to manhood before being informed of the existence of a Deity, and of our relation to him; the principles of religion, when communicated, no longer produce the same happy effects: the heart and the understanding are no longer in the same state; nor will the same associations be formed.

This doctrine of the *association of ideas* has been adopted by an ingenious writer, distinguished for his discoveries in natural philosophy, and for his labours in controversial divinity, as an argument in behalf of the propriety of instructing youth in the principles of religion even in their earliest years. We admire, we esteem, the spirit which has prompted him to discover so much concern for the interests of the rising generation; but at the same time we will not conceal our opinion, that even this argument ought to be urged with caution. Many of the phenomena of human nature may indeed be explained, if we have recourse to the principle of *association*. The influence of any principle, religious or moral, depends in a great measure on the ideas and images which, in considering it, we have been accustomed to associate with it in our minds. But what are the ideas or images most likely to be associated by children with the doctrines and duties of religion, if we call them to listen to the one and perform the other at too early a period? Will they be such as may assist the influence of religion on their sentiments and conduct in the future part of life? Observe the world: Are those who, in infancy, have been most rigidly compelled to get their catechisms by rote, either the most pious or the best informed in religious matters? Indeed, when we consider what has been said of the influence of habit, and of the association of ideas, we cannot help thinking, that any arguments which on the present occasion may be adduced from either of these, tend directly to prove, not that we ought to pour in religious instruction into the minds of children, without considering whether they be qualified to receive it; but, on the contrary, that we ought cautiously to wait for and catch the proper season;—that season when the youthful mind, no longer a stranger to our language, our sentiments,

sentiments, our views of nature, or our manner of reasoning, will be able to go along with us, when we talk to him of a supreme Being, of our condition as dependant and accountable creatures, of truth, benevolence, and justice.

We flatter ourselves, then, that our readers will readily agree with us, 1st, That the moral and reasoning powers of children begin to display themselves at a very early age, even in infancy. 2dly, That as soon as they have made themselves acquainted with the most obvious appearances of nature, and have gained a tolerable knowledge of our language and our manner of arranging our ideas in reasoning, we may with the greatest propriety begin to instruct them in the principles of religion. 3dly, That the most careful and judicious observation is necessary to enable us to distinguish the period at which children become capable of receiving religious instruction; because, if we either attempt to communicate to them these important truths too early, or defer them till towards manhood, we may view of accomplishing the great end which we have in view.

If we can be so fortunate as to choose the happiest season for sowing the first seeds of piety in the infant mind, our next care will be to sow them in a proper manner. We must anxiously endeavour to communicate the principles of religion and morality, so as they may be easiest comprehended by the understanding of the learner, and may make the deepest impression on his heart. It would be a matter of the greatest difficulty to give particular directions on this head. The discretion of the parent or tutor must here be his guide. We are afraid that some of the catechisms commonly taught are not very happily calculated to serve the purpose for which they are intended. Yet we do not wish that they should be neglected while nothing more proper is introduced in their room. In instructing children in the first principles of religion, we must beware of arraying piety in the gloomy garb, or painting her with the forbidding features, in which she has been represented by anchorites, monks, and puritans. No; let her assume a pleasing form, a cheerful dress, and an inviting manner. Describe the Deity as the affectionate parent, the benefactor, and though the impartial yet the merciful judge of mankind. Exhibit to them Jesus Christ, the generous friend and favourer of the posterity of Adam, who with such enchanting benevolence hath said, "Suffer little children to come unto me." Represent to them his yoke as easy, and his burden as light. Insist not on their saying long prayers or hearing tedious sermons. If possible, make the doctrines of religion to appear to them as glad tidings, and its duties as the most delightful of tasks.

V. The Languages.

Is the time usually spent in learning the languages usefully occupied? What advantages can our British youth derive from an acquaintance with the languages and the learning of Greece and Rome? Would we listen to many of the fathers, the mothers, and the polite tutors of the present age, they will persuade us, that the time which is dedicated to grammar-schools, and to Virgil, Cicero, Homer, and Demosthenes, is foolishly thrown away; and that

no advantages can be gained from the study of classical learning. They with their children and pupils to be not merely scholars; they wish them to acquire what may be useful and ornamental when they come to mingle with the world; and for this purpose, they think it much better to teach their young people to smatter out French, to dance, to fence, to appear in company with invincible assurance, and to dress in such a manner as may attract the attention of the ladies. Besides, the tenderness and humanity of those people are amazing. They are shocked at the idea of the sufferings which boys undergo in the course of a classical education. The confinement, the stripes, the harsh language, the burdens laid on the memory, and the pain occasioned to the eyes, during the dreary period spent in acquiring a knowledge of Greek and Latin, affect them with horror when they think of them as inflicted on children. They therefore give the preference to a plan of education in which less intense application is required and less severity employed.

But, again, there are others who are no less warm in their eulogiums on a classical education, and no less industrious in recommending the study of Greek and Latin, than those are eager in their endeavours to draw neglect on the polished languages of antiquity. With this second class, if an adept in Greek and Latin, you are a great and learned man; but without those languages, contemptible for ignorance. They think it impossible to inspire the youthful mind with generous or virtuous sentiments, to teach the boy wisdom, or to animate him with courage, without the assistance of the ancient philosophers, historians, and poets. Indeed their superstitious reverence for the ancient languages, and for those writers whose compositions have rendered Greece and Rome so illustrious, leads them to ascribe many other still more wonderful virtues to a classical education.

With which of these parties shall we join? or shall we mediate between them? Is it improper to call youth to the study of the languages? Is it impossible to communicate any useful knowledge without them? Or are they, though highly useful, yet not always indispensably necessary?

We have formerly taken notice of one circumstance in favour of a classical education, to which it may be classical proper to recal the attention of our readers. We observed, that the cultivation of classical learning has a favourable influence on the living languages. It has a tendency to preserve their purity from being debased, and their analogy from becoming irregular. In studying the dead languages, we find it necessary to pay more attention to the principles of grammar than in acquiring our mother-tongue. We learn our native language without attending much to its analogy and structure. Of the numbers who speak English through the British dominions, but few are skilled in the inflexion of its nouns and verbs, or able to distinguish between adverbs and conjunctions. Desirous only of making their meaning understood, they are not anxious about purity or correctness of speech. They reject not an expression which occurs to them, because it is barbarous or ungrammatical. As they grew up they learned to speak from their mothers, their nurses, and others about them: they were soon able to make known their wants, their wishes, and their observations,

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Prejudices
against clas-
sical educa-
tion.

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Prejudices
for it.

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Catechisms.

66

Utility of
learning to-
wards the im-
provement
of our mother
tongue.

Education. tions, in words. Satisfied with this, or called at a very early period to a life of humble industry, they have continued to express themselves in their mother-tongue without acquiring any accurate knowledge of its general principles. If these people find occasion to express themselves in writing, they are scarce more studious of correctness and elegance in writing than in speaking; or, though they may aspire after those properties, yet they can never attain them. But such writers or speakers can never refine any language, or reduce it to a regular analogy. Neither can they be expected to distinguish themselves as the guardians of the purity and regularity of their native tongue, if it should before have attained a high degree of perfection. But they who, in learning a language different from their native tongue, have found it necessary to pay particular attention to the principles of grammar, afterwards apply the knowledge of grammar which they have thus acquired in using their mother-tongue; and by that means become better acquainted with its structure, and learn to write and speak it with more correctness and propriety. Besides, the languages of Greece and Rome are so highly distinguished for their copiousness, their regular analogy, and for various other excellencies, which render them superior to even the chief of modern languages, that the study of them has a natural tendency to improve and enrich modern languages. If we look backwards to the 15th century, when learning began to revive in Europe, and that species of learning which began first to be cultivated was classical literature, we find that almost all the languages then spoken in Europe were wretchedly poor and barbarous. Knowledge could not be communicated, nor business transacted, without calling in the aid of Latin. Classical learning, however, soon came to be cultivated by all ranks with enthusiastic eagerness. Not only those designed to pursue a learned profession, and men of fortune whose object was a liberal education without a view to any particular profession; but even the lower ranks, and the female sex, keenly studied the languages and the wisdom of Greece and Rome. This avidity for classical learning was followed by many happy effects. But its influence was chiefly remarkable in producing an amazing change on the form of the living languages. These soon became more copious and regular; and many of them have consequently attained such perfection, that the poet, the historian, and the philosopher, can clothe their thoughts in them to the greatest advantage. Could we derive no new advantage from the study of the ancient languages, yet would they be worthy of our care, as having contributed so much to raise the modern languages to their present improved state. But they can also conduce to the preservation and support of those noble structures which have been reared by their assistance. The intercourse of nations, the affectation of writers, the gradual introduction of provincial barbarisms, and various other causes, have a tendency to corrupt and debase even the noblest languages. By such means were the languages of Greece and Rome gradually corrupted, till the language used by a Horace, a Livy, a Xenophon, and a Menander, was lost in a jargon unfit for the purposes of composition. But if we would not disdain to take advantage of them, the classical works in those languages might

prevent that which we use from experiencing such a decline. He who knows and admires the excellencies of the ancient languages, and the beauties of those writers who have rendered them so celebrated, will be the firm enemy of barbarism, affectation, and negligence, whenever they attempt to debase his mother-tongue. We venture therefore to assert, that when the polished languages of antiquity cease to be studied among us, our native tongue will then lose its purity, regularity, and other excellencies, and gradually decline till it be no longer known for the language of Pope and of Addison; and we adduce it as an argument in behalf of classical learning, that it has contributed so much to the improvement of the living languages, and is almost the only means that can prevent them from being corrupted and debased.

In those plans of education of which the study of the dead languages does not make a part, proper means are seldom adopted for impressing the youthful mind with habits of industry: nor do the judgment, the memory, and the other powers of the mind, receive equal improvement, as they pass not through the same exercises as in a classical education. Let us enter those academies where the way to a complete education leads not through the thorny and rugged paths of classical literature; let us attend to the exercises which the polite teachers cause their pupils to perform. Do they insist on laborious industry or intense application? No; they can communicate knowledge without requiring laborious study. They profess to allow their pupils to enjoy the sweets of idleness, and yet render them prodigies of learning. But are their magnificent promises ever fulfilled? Do they indeed cultivate the understandings of the young people intrusted to their care? They do not: their care is never once directed to this important object. To adorn them with showy and superficial qualities, is all that those gentlemen aim at. Hence, when their pupils come to enter the world and engage in the duties of active life, they appear destitute of every manly qualification. Though they have attained the age and grown up to the size of manhood, their understandings are still childish and feeble: they are capricious, unsteady, incapable of industry or fortitude, and unable to pursue any particular object with keen, unremitting perseverance. That long series of study and regular application, which is requisite in order to attain skill in the ancient languages, produces much happier effects on the youthful mind. The power of habit is universally felt and acknowledged. As he who is permitted to trifle away the earliest part of his life in idleness or in frivolous occupations, can scarce be expected to display any manly or vigorous qualities when he reaches a more mature age; so, on the contrary, he whose earlier days have been employed in exercising his memory and furnishing it with valuable treasures, in cultivating his judgment and reasoning powers by calling the one to make frequent distinctions between various objects, and the other to deduce many inferences from the comparison of the various objects presented to the understanding, and also in strengthening and improving the acuteness of his moral powers by attending to human actions and characters, and distinguishing between them, as virtuous or vicious, as mean or glorious: he who has thus cultivated his powers, may be naturally

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For inuring
to industry.

Education. expected to distinguish himself when he comes to perform his part in active life, by prudence, activity, firmness, perseverance, and most of the other noble qualities which can adorn a human character. But in the course of a classical education, the powers of the mind receive this cultivation; and therefore these happy effects may be expected to follow from it. The repetitions which are required afford improving exercise to the memory, and store it with the most valuable treasures: the powers of the understanding are employed in observing the distinctions between words; in tracing words to the substances and qualities in nature which they are used to represent; in comparing the words and idioms of different languages, and in tracing the laws of their analogy and construction; while our moral faculties are at the same time improved, by attending to the characters which are described, and the events and actions which are related, in those books which we are directed to peruse in order to acquire the ancient languages. We assert therefore, that the study of the ancient languages is particularly useful for improving and strengthening all the powers of the mind; and, by that means, for preparing us to act our part in life in a becoming manner: and this our readers will readily agree with us in considering as a weighty argument in behalf of that plan of education.

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Fund of
useful and
elegant
knowledge
which an-
cient au-
thors af-
ford.

But if, after all, classical learning is still to be given up, where shall we find the same treasures of moral wisdom, of elegance, and of useful historical knowledge, which the celebrated writers of Greece and Rome afford? Will you content yourself with the modern writers of Italy, France, and England? Or will you deign to survey the beauties of Homer and Virgil through the medium of a translation? No surely; let us penetrate to those sources from which the modern writers have derived most of the excellencies which recommend them to our notice; let us disdain to be imposed upon by the whims or the ignorance of a translator.

Quos integros accipere fontes.

Farther, classical learning has long been cultivated among us; and both by the stores of knowledge which it has conveyed to the mind, and the habits which it has impressed, has contributed in no small degree to form many illustrious characters. In reviewing the annals of our country, we will scarce find an eminent politician, patriot, general, or philosopher, during the two last centuries, who did not spend his earlier years in the study of the classics.

Yet though we have mentioned these things in favour of classical literature, and were we to descend to minute particulars might enumerate many more facts and circumstances to recommend it; we mean not to argue that it is absolutely impossible to be a wife, a great, or a good man, unless you are skilled in Greek and Latin. Means may, no doubt, be adopted to inspire the young mind with virtuous dispositions, to call forth the powers of the youthful understanding, and to impress habits of industry and vigorous perseverance, without having recourse to the discipline of a grammar school. But we cannot help thinking, for the reasons which we have stated to our readers, that a classical education is the most likely to produce these happy effects.

As we are afterwards to take particular notice of
No 109.

the course of education most suitable for those who Education. are to occupy the humble stations in society, we shall not here inquire whether it be proper to introduce them to an acquaintance with the Greek and Latin classics.

VI. On the Education of People of Rank and Fortune.

Those whom the kindness of Providence has placed in an elevated station, and in affluent circumstances, so that they seem to be born rather to the enjoyment of wealth and honours than to act in any particular profession or employment, have notwithstanding a certain part assigned them to perform, and many important duties to fulfil. They are members of society, and enjoy the protection of the civil institutions of that society to which they belong; they must therefore contribute what they can to the support of those institutions. The labours of the industrious poor are necessary to supply them with the luxuries of life; and they must know how to distribute their wealth with prudence and generosity among the poor. They enjoy much leisure; and they ought to know how to employ their leisure hours in an innocent and agreeable manner. Besides, as their circumstances enable them to attract the regard and respect of those who are placed in inferior stations, and as the poor are ever ready to imitate the conduct of their superiors; it is necessary that they endeavour to adorn their wealth and honours by the most eminent virtues, in order that their example may have an happy influence on the manners of the community.

There education ought therefore to be conducted with a view to these ends. After what we have urged in favour of a classical education, our readers will naturally presume that we regard it as highly proper for a man of fortune. The youth who is destined to the enjoyment of wealth and honours, cannot spend his earlier years more advantageously than in gaining an acquaintance with the elegant remains of antiquity. The benefits to be derived from classical learning are peculiarly necessary to him. Care must be taken to preserve him from acquiring an haughty, fierce, imperious temper. The attention usually paid to the children of people of fortune, and the foolish fondness with which they are too often treated, have a direct tendency to inspire them with high notions of their own importance, and to render them passionate, overbearing, and conceited. But if their temper acquire this bias even in childhood, what may be expected when they advance towards manhood, when their attention is likely to be oftener turned to the dignity and importance of that rank which they occupy, and to the pitiful humility of those beneath them? Why, they are likely to be so proud, insolent, resentful, and revengeful, as to render themselves disagreeable and hateful to all who know them; and besides, to be incapable of those delightful feelings which attend humane, benevolent, and mild dispositions. Let the man of fortune, therefore, as he is concerned for the future happiness and dignity of his child, be no less careful to prevent him from being treated in such a manner as to be inspired with haughtiness, caprice, and insolence, than to prevent his mind from being soured by harsh and tyrannical usage.

The manly exercises, as they are favourable to the health, the strength, and even the morals; so they are
highly

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Duties of
people of
rank.

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How to
form the
temper of
a young
man of for-
tune.

Education. highly worthy of engaging the attention of the young gentleman. Dancing, fencing, running, horsemanship, the management of the muleket, and the motions of military discipline, are none of them unworthy of occupying his time, at proper seasons. It is unnecessary to point out the advantages which he may derive from dancing; these seem to be pretty generally understood. Perhaps our men of fortune would be ashamed to make use of their legs for running; but occasions may occur, on which even this humble accomplishment may be useful. Though we wish not to see the young man of fortune become a jockey; yet to be able to make a graceful appearance on horseback, and to manage his horse with dexterity, will not be unworthy of his station and character. If times of public danger should arise, and the state should call for the services of her subjects against any hostile attack, they whose rank and fortune place them in the most eminent stations will be first expected to stand forth; but if unacquainted with those exercises which are connected with the military art, what a pitiful figure must they make in the camp, or on the field of battle?

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Law.

As the man of fortune may perhaps enjoy by hereditary right, or may be called by the voice of his fellow-citizens, to a seat among the legislative body of his country; he ought in his youth to be carefully instructed in the principles of her political constitution, and of those laws by which his own rights and the rights of his fellow-citizens are determined and secured.

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Philosophy.

Natural philosophy, as being both highly useful and entertaining, is well worthy of the attention of all who can afford to appropriate any part of their time to scientific pursuits; to the man of fortune, a taste for natural philosophy might often procure the most delightful entertainment. To trace the wonders of the planetary systems, to mark the process of vegetation, to examine all the properties of that fine element which we breathe, to trace the laws by which all the different elements are confined to their proper functions, and above all to apply the principles of natural philosophy in the cultivation of the ground, are amusements which might agreeably and innocently occupy many of the leisure hours of the man who enjoys a splendid and independent fortune.

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History and morals.

Neither do we suppose civil history and the principles of morals to be overlooked. Without being acquainted with these, how could any just or accurate knowledge of the laws and political constitution of his country be acquired by the young gentleman? History exposes to our observation the fortune and the actions of other human beings, and thus supplies in some measure the place of experience; it teaches prudence, and affords exercise to the moral sense. When history condescends to take notice of individuals, they are almost always such as have been eminent for virtue, for abilities, or for the rank which they held in life; to the rich and great it ought to speak with peculiar efficacy, and they ought to be carefully invited to listen to its voice.

Such then is the manner in which we wish the education of young men of rank and fortune to be conducted, in order that they may be prepared for enjoying their opulence and honours with becoming dignity. Let them be early inured to habits of vigorous

industry and persevering firmness, by passing through a regular course of classical learning in a free school; let them play and converse with their equals, and not be permitted to form high ideas of their own importance, nor to domineer over servants or inferiors: Let them be carefully instructed in the principles of morality and religion: Let them be taught the manly exercises: Let them be carefully informed of the nature of the political constitution of their country, and of the extent of those civil and political rights which it secures to them and their fellow-citizens: Let them be called to trace the annals of mankind through the records of history; to mark the appearances and operations of nature, and to amuse themselves by pursuing these to their general causes. We say nothing of causing the young man of fortune to learn some mechanical art: We think skill in a mechanical art might now and then afford him an innocent and pleasing amusement; but we do not consider it as absolutely necessary, and therefore do not insist on his acquiring it. With those accomplishments we hope he might become an useful member of society, might adorn the rank and fortune to which he is born, and might find wealth and high station a blessing, not a curse. It is peculiarly unfortunate for our age and country, that people of rank and fortune are not so studious that their children acquire these as the more superficial accomplishments.

VII. *On the Education of People designed for a Mercantile Employment, and for the humbler Occupations in Life not particularly connected with Literature.*

WERE modern literature in a less flourishing state; were the English and French languages adorned with fewer eminent poetical, historical, and philosophical compositions; we might perhaps insist on it as necessary to give the boy, who is designed for a mercantile employment, a classical education. At present this does not appear absolutely necessary; yet we do not presume to forbid it as improper. Even the elegant merchant will scarce find reason to repent his having been introduced to the acquaintance of Plato and Cicero. But still, if the circumstances of the parent, or any other just reason, should render it inconvenient to send the young man who is intended for trade to a free school to study the ancient languages, means may be easily adopted to make up for his loss. Confine him not to writing and accounts alone. These, though particularly useful to the merchant, have no great power to restrain the force of evil passions, or to inspire the mind with generous and virtuous sentiments. Though you burden him not with Latin and Greek, yet strive to inspire him with a taste for useful knowledge and for elegant literature. Some of the purest and most elegant of our poets, the excellent periodical works which have appeared in our language, such as the Spectator, the Adventurer, the Mirror, and the compositions of our British historians, together with some of the best translations of the classics which we possess; these you may with great propriety put into his hands. They will teach him how to think and reason justly, and to express himself in conversation or in writing with correctness and elegance: they will refine and polish his mind, and raise him above low and gross pleasures. And as no man, who has any occasion to speak or write, ought to be entirely ignorant of the principles of grammar, you will

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the Elegant Literature.

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therefore

Education. therefore be careful to instruct the young man who is designed for a mercantile occupation in the grammar of his mother-tongue.

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Integrity.

A sacred regard to his engagements, and an honesty which may prevent him from taking undue advantages or exacting unreasonable profits, are the virtues which a merchant is most frequently called to exercise: punctuality and integrity are the duties most particularly incumbent on the mercantile profession. Temptations will now and then arise to seduce the merchant to the violation of these. But if superior to every such temptation, he is one of the most illustrious characters, and is likely to be one of the most successful merchants. From his earliest years, then, labour to inspire the child whom you intend for trade with a sacred regard for truth and justice: let him be taught to view deceit and fraud, and the violation of a promise, with abhorrence and disdain. Frugality is a virtue which, in the present age, seems to be antiquated or proscribed. Even the merchant often appears better skilled in the arts of profusion than in those of parsimony. The miser, a character at no time viewed as amiable, is at present beheld with double detestation and contempt. Yet, notwithstanding these unfavourable circumstances, fear not to impress on the young merchant habits of frugality. Let him know the folly of beginning to spend a fortune before he have acquired it. Let him be taught to regard a regular attention to confine his expences within due bounds, as one of the first virtues which can adorn his character.

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Industry.

Frugality and industry are so closely connected, that when we recommend the one of them to the merchant, we will be naturally understood to recommend the other also. It is easy to see, that, without industrious application, no man can reasonably expect to meet with success in the occupation in which he engages: and if the merchant thinks proper to leave his business to the management of clerks and shop-keepers, it is not very probable that he will quickly accumulate a fortune. It is, therefore, no less necessary, that he who is intended for trade be early accustomed to habits of sober application, and be carefully restrained from volatility and levity, than that he be instructed in writing, arithmetic, and keeping of accounts.

With these virtues and qualifications the merchant is likely to be respectable, and not unsuccessful, while he continues to prosecute his trade; and if, by the blessing of Providence, he be at length enabled to accumulate a moderate fortune, his acquaintance with elegant literature, and the virtuous habits which he has acquired, will enable him to enjoy it with taste and dignity. Indeed, all the advantages which a man without taste, or knowledge, or virtue, can derive from the possession of even the most splendid fortune, are so inconsiderable, that they can be no adequate reward for the toil which he undergoes, and the mean arts which he practises in acquiring it. At the head of a great fortune a fool can only make himself more ridiculous, and a man of a wicked and vicious character more generally abhorred, than if fortune had kindly concealed their crimes and follies by placing them in a more obscure station.

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Education of persons in the lower ranks.

A considerable part of the members of society are placed in such circumstances, that it is impossible for them to receive the advantages of a liberal education. The mechanic and the husbandman, who earn a subsist-

ence by their daily labour, can seldom afford, whatever Education. parental fondness may suggest, to favour their children with many opportunities of literary instruction. Content if they can provide them with food and raiment till such time as they acquire sufficient strength to labour for their own support, parents in those humble circumstances seldom think it necessary that they should concern themselves about giving their children learning. Happily it is not requisite that those who are destined to spend their days in this low sphere should be furnished with much literary or scientific knowledge. They may be taught to read their mother tongue, to write, and to perform some of the most common and the most generally useful operations of arithmetic: for without an acquaintance with the art of reading, it will scarce be possible for them to acquire any rational knowledge of the doctrines and precepts of religion, or of the duties of morality; the invaluable volume of the sacred scriptures would be sealed to them: we may allow them to write, in order that they may be enabled to enjoy the sweet satisfaction of communicating accounts of their welfare to their absent friends; and, besides, both writing and arithmetic are necessary for the accomplishment of those little transactions which pass among them. It would be hard, if even the lowest and poorest were denied these simple and easily acquired branches of education; and happily that degree of skill in them which is necessary for the labourer and the mechanic may be attained without greater expence than may be afforded by parents in the meanest circumstances. Let the youth who is born to pass his days in this humble station be carefully taught to consider honest patient industry as one of the first of virtues: let him be taught to regard the sluggard as one of the most contemptible of characters: teach him contentment with his lot, by letting him know that wealth and honour seldom confer superior happiness: Yet scruple not to inform him, that if he can raise himself above the humble condition to which he was born, by honest arts, by abilities virtuously exerted, he may find some comfort in affluent circumstances, and may find reason to rejoice that he has been virtuous, industrious, and active. In teaching him the principles of religion, be careful to show him religion as intimately connected with morality: teach him none of those mysterious doctrines, whose sole tendency is to foster that enthusiasm which naturally prevails among the vulgar, and to persuade them that they may be pious without being virtuous. Labour to inspire him with an invincible abhorrence for lying, fraud, and theft. Inspire him with an high esteem for chastity, and with an awful regard to the duties of a son, an husband, and a father. Thus may he become respectable and happy, even in his humble station and indigent circumstances; a character infinitely superior, in the eyes of both God and man, to the rich and great man who misemploys his wealth and leisure in shameful and vicious pursuits.

VIII. On the Education of the Female Sex.

THE abstracts which we have given of some of the most celebrated and original treatises on education, as well as our own observations on this subject, have been hitherto either relative to the education of both the sexes, or directed chiefly to the education of the male sex. But as there is a natural difference between the charac-

Education. ters of the two sexes, and as there are certain duties peculiar to each of them; it is easy to see that the education of the boy and that of the girl cannot, ought not, to be conducted precisely in the same manner. And since the duties of the female sex are so important to society, and they form so considerable a part of our species; their education, therefore, merits the highest attention.

In infancy, the instincts, the dispositions, and the faculties of boys and girls seem to be nearly the same. They discover the same curiosity, and the same disposition to activity. For a while they are fond of the same sports and amusements. But by and by, when we begin to make a distinction in their dress; when the girl begins to be more confined to a sedentary life under her mother's eye, while the boys are permitted to ramble about without doors; the distinction between their characters begins to be formed, and their taste and manners begin to become different. The boy now imitates the arts and the active amusements of his father; digs and plants a little garden, builds a house in miniature, shoots his bow, or draws his little cart; while the girl, with no less emulation, imitates her mother, knits, sews, and dresses her doll. They are no longer merely children: the one is now a girl; the other a boy. This taste for female arts, which the girl so easily and naturally acquires, has been judiciously taken notice of by Rousseau, as affording an happy opportunity for instructing her in a very considerable part of those arts which it is proper to teach her. While the girl is busied in adorning her doll, she insensibly becomes expert at needle-work, and learns how to adjust her own dress in a becoming manner. And therefore, if she be kindly treated, it will not be a matter of difficulty to prevail with her to apply to these branches of female education. Her mother or governess, if capable of managing her with mildness and prudence, may teach her to read with great facility. For being already more disposed to sedentary application than the boy of the same age, the confinement to which she must submit in order to learn to read will be less irksome to her. Some have pretended that the reasoning powers of girls begin to exert themselves sooner than those of boys. But, as we have already declared our opinion, that the reasoning powers of children of both sexes begin to display themselves at a very early period; so we do not believe that those of the one sex begin to appear, or attain maturity, sooner than those of the other. But the different occupations and amusements in which we cause them to engage from their earliest years, naturally call forth their powers in different manners, and perhaps cause the one to imitate our modes of speaking and behaviour sooner than the other. However, as we wish both boys and girls to learn the art of reading at a very early age, even as soon as they are capable of any serious application; so we wish girls to be taught the art of writing, arithmetic, and the principles of religion and morals, in the same order in which these are inculcated on boys.

We need not point out the reasons which induce us to regard these as accomplishments proper for the female sex: they seem to be generally considered as not only suitable, but necessary. It is our most important privilege, as beings placed in a situation different from that of the inferior animals, that we are capable of religious sentiments and religious knowledge; it there-

fore becomes us to communicate religious instruction Education. with no less assiduity and care to the youth of the female sex than to those of our own. Besides, as the care of children during their earlier years belongs in a particular manner to the mother; she, therefore, whom nature has destined to the important duties of a mother, ought to be carefully prepared for the proper discharge of those duties, by being accurately instructed, in her youth, in such things as it will be afterwards requisite for her to teach her children.

Ladies have sometimes distinguished themselves as prodigies of learning. Many of the most eminent geniuses of the French nation have been of the female sex. Several of our countrywomen have also made a respectable figure in the republic of letters. Yet we cannot approve of giving girls a learned education, coming in

To acquire the accomplishments which are more proper for their sex, will afford sufficient employment for their earlier years. If they be instructed in the grammar of their mother-tongue, and taught to read and speak it with propriety; be taught to write a fair hand, and to perform with readiness the most useful operations of arithmetic: if they be instructed in the nature of the duties which they owe to God, to themselves, and to society; this will be almost all the literary instruction necessary for them. Yet we do not mean to forbid them an acquaintance with the literature of their country. The periodical writers, who have taught all the duties of morality, the deencies of life, and the principles of taste, in so elegant and pleasing a manner, may with great propriety be put into the hands of our female pupil. Neither will we deny her the historians, the most popular voyages and travels, and such of our British poets as may be put into her hands without corrupting her heart or inflaming her passions. But could our opinion or advice have so much influence, we would endeavour to persuade our countrymen and countrywomen to banish from among them the novellists, those panders of vice, with no less determined severity than that with which Plato excludes the poets from his republic, or that with which the converts to Christianity, mentioned in the Acts, condemned their magical volumes to the flames. Unhappily, novels and plays are almost the only species of reading in which the young people of the present age take delight; and nothing has contributed more effectually to bring on that dissoluteness of manners which prevails among all ranks.

But we will not discover so much austerity as to express a wish that the education of the female sex should be confined solely to such things as are plain and useful. We forbid not those accomplishments which are merely ornamental, and the design of which is to render them amiable in the eyes of the other ⁸⁹sexes. When we consider the duties for which they are destined by nature, we find that the art of pleasing constitutes no inconsiderable part of these; and it would be wrong, therefore, to deny them those arts, the end of which is to enable them to please. Let them endeavour to acquire taste in dress: to dress in a neat graceful manner, to suit colours to her complexion, and the figure of her clothes to her shape, is no small accomplishment for a young woman. She who is rigged out by the taste and dexterity of her maid and her milliner, is nothing better than a doll

sent abroad to public places as a sample of their handy-work. Dancing is a favourite exercise; nay, we might almost call it the favourite study of the fair sex: So many pleasing images are associated with the idea of dancing; dress, attendance, balls, elegance and grace of motion irresistible, admiration, and courtship: and these are so early inculcated on the young by mothers and maids, that we need not be surprised if little Miss consider her lesson of dancing as a matter of much more importance than either her book or sampler. And indeed, though the public in general seem at present to place too high a value on dancing; and though the undue estimation which is paid to it seems owing to that taste for dissipation, and that rage for public amusements, which naturally prevail amid such refinement and opulence; yet still dancing is an accomplishment which both sexes may cultivate with considerable advantage. It has an happy effect on the figure, the air, and the carriage; and we know not if it be not favourable even to dignity of mind: Yet, as to be even a first-rate poet or painter, and to value himself on his genius in these arts, would be no real ornament to the character of a great monarch; so any very superior skill in dancing must serve rather to disgrace than to adorn the lady or the gentleman. There are some arts in which, though a moderate degree of skill may be useful or ornamental, yet superior taste and knowledge are rather hurtful, as they have a tendency to seduce us from the more important duties which we owe to ourselves and to society. Of those, dancing seems to be one: It is said of a certain Roman lady, by an eloquent historian, "that she was more skilled in dancing than became a modest and virtuous woman."

Music, also, is an art in which the youth of the female sex are pretty generally instructed; and if their voice and ear be such as to enable them to attain any excellence in vocal music, it may conduce greatly to increase their influence over our sex, and may afford a pleasing and elegant amusement to their leisure hours. The harpsichord and the spinnet are instruments often touched by female hands; nor do we presume to forbid the ladies to exercise their delicate fingers in calling forth the enchanting sounds of these instruments. But still, if your daughter have no voice or ear for music, compel her not to apply to it.

Drawing is another accomplishment which generally enters into the plan of female education. Girls are usually taught to aim at some scratches with a pencil: but when they grow up, they either lay it totally aside, or else apply to it with so much assiduity as to neglect their more important duties. We do not consider skill in drawing, any more than skill in poetry, as an accomplishment very necessary for the ladies; yet we agree with Rousseau, that as far as it can contribute to improve their taste in dress, it may not be improper for them to pursue it. They may very properly be taught to sketch and colour flowers; but we do not wish them to forget or lay aside this as soon as the drawing-master is dismissed: let them retain it to be useful through life. Though pride can never be lovely, even in the fairest female form; yet ought the young woman to be carefully impressed with a due respect for herself. This will join with her native modesty to be the guardian of her virtue, and to preserve her from levity and impropriety of conduct.

Such are the hints which have occurred to us on the education proper for the female sex, as far as it ought to be conducted in a manner different from that of the male.

IX. Public and private Education.

One question usually discussed by the writers on this subject has not hitherto engaged our attention. It is, Whether it be most proper to educate a young man privately, or send him to receive his education at a public school? This question has been so often agitated, and by people enjoying opportunities of receiving all the information which experience can furnish on the subject, that we cannot be expected to advance any new argument of importance on either side. Yet we may state what has been urged both on the one and the other.

They who have considered children as receiving their education in the house and under the eye of their parents, and as secluded in a great measure from the society of other children, have been sometimes led to consider this situation as particularly favourable for their acquiring useful knowledge, and being formed to virtuous habits. Though we reap many advantages from mingling in social life, yet in society we are also tainted with many vices to which he who passes his life in solitary retirement is a stranger. At whatever period of life we begin to mix with the world, we still find that we have not yet acquired sufficient strength to resist those temptations to vice with which we are there assailed. But if we are thus ready to be infected with the contagion of vice, even at any age, no other argument can be necessary to show the propriety of confining children from those dangerous scenes in which this infection is so easily caught. And whoever surveys the state of morals in a public school with careful and candid attention, even though it be under the management of the most virtuous, judicious, and assiduous teachers, will find reason to acknowledge, that the empire of vice is established there not less fully than in the great world. Nothing, therefore, can be more negligent or inhuman, than for parents to expose their children to those seductions which a great school presents, at a time when they are strongly disposed to imitate any example set before them, and have not yet learned to distinguish between such examples as are worthy of imitation, and those which ought to be beheld with abhorrence. Even when under the parent's eye, from intercourse with servants and visitors their native innocence is likely to suffer considerably. Yet the parent's care will be much more likely to preserve the manners of his child uncorrupted in his own house, than any assiduity and watchfulness of his teachers in a school.

The morals and dispositions of a child ought to be the first objects of our concern in conducting his education: but to initiate him in the principles of useful knowledge is also an important object; and it will be happy, if in a private education virtue be not only better secured, but knowledge also more readily acquired, than in a public. But this actually happens. When one or two boys are committed to the care of a judicious tutor, he can watch the most favourable seasons for communicating instruction; he can awake curiosity and command attention by the gentle arts of insinuation: though he strive not to inflame their breasts with emulation, which leads often to envy and invective.

Education rate hatred; yet he will succeed in rendering learning pleasing, by other means less likely to produce unfavourable effects on the temper and dispositions of his pupils. As his attention is not divided among a number, he can pay more regard to the particular dispositions and turn of mind of each of his pupils: he can encourage him who is modest and slow, and repress the quickness and volatility of the other; and he can call forth and improve their powers, by leading them at one time to view the scenes of nature and the changes which the successively undergoes through the varying seasons; at another, to attend to some of the most entertaining experiments of natural philosophy; and again alluring them artfully to their literary exercises. With these he may mix some active games; and he may assume so much of the fondness of the parent, as to join in them with his little pupils. These are certainly circumstances favourable both to the happiness and to the literary improvement of youth; but they are peculiar to a private education. Besides, in a private education, as children spend more of their time with grown up people than in a public; those, therefore, who receive a domestic education, sooner acquire our manner of thinking, of expressing ourselves, and of behaving, in our ordinary intercourse with one another. For the very same reason for which girls are often observed to be capable of prudence and propriety of behaviour at an earlier age than boys, those boys who receive a family education will begin sooner to think and act like men, than those who pass their earlier days in a public seminary. And though you educate your son at home, there is no reason why he should be more accustomed to domineer over his inferiors, or to indulge a capricious or inhuman disposition, than if he were brought up among fifty boys, all of the same age, size, and rank, with himself. He may also, in a private education, exercise his limbs with the same activity as in a public one. He cannot, indeed, engage in those sports for which a party of companions is necessary; but still there are a thousand objects which will call forth his activity: if in the country, he will be disposed to fish, to climb for bird-nests, to imitate all that he sees performed by labourers and mechanics: in short, he will run, leap, throw and carry stones, and keenly exert himself in a variety of exercises, which will produce the most favourable effects on the powers both of his mind and body. It may indeed be possible for you to oppose the designs of nature so effectually, if you take pains for that purpose, as to repress the natural activity of your child or pupil, and cause him to pine away his time in listless indolence; but you will thus do violence to his dispositions, as well as to those instincts which nature has for wise purposes implanted in his breast. And the bad consequences which may result from this management are not to be considered as the natural effects of a domestic education, but as the effects of an education carelessly or imprudently conducted.

But there is another consideration which will perhaps be still more likely than any of those which we have hitherto urged, to prevail with the fond parent to give his child a private education. As the infant who is abandoned by its mother to the care of an hiring nurse, naturally transfers its affection from the unnatural parent to the person who supplies her room

and performs the duties incumbent upon her; so the boy who is banished from his parent's house at a time when he has scarce begun to know the relation in which he stands to his father and mother, brothers or sisters, soon ceases to regard them with that fondness which he had contracted for them from living in their company and receiving their good offices. His respect, his affection, and his kindness, are bestowed on new objects, perhaps on his master or his companions; or else his heart becomes selfish and destitute of every tender and generous feeling; and when the gentle and amiable affections of filial and fraternal love are thus, as it were, torn up by the roots, every evil passion springs up, with a rapid growth, to supply their places. The boy returns afterwards to his father's house: but he returns as a stranger; he is no longer capable of regarding his parents and relations with the same tenderness of affection. He is now a stranger to that filial love which springs up in the breast of the child who is constantly sensible of the tender care of his parents, and spends his earlier years under their roof, in such a manner as to appear the effect of instinct rather than of habit. Selfish views are now the only bond which attaches him to his parents and relations; and by coming under their influence at so early a period of life, he is rendered for ever incapable of all the most amiable virtues which can adorn human nature. Let the parent, therefore, who loves his child, and wishes to obtain from him a mutual return of affection, beware of excluding him from his house, and devolving the sole charge of him upon another, in his childhood.

These views represent a private education as the most favourable to virtue, to knowledge, and to the mutual affection which ought always to unite the parent and his child. But let us now listen to the arguments which are usually urged in behalf of a public education.

In the first place, it has been asserted, that a public education is much more favourable than a private to the pupil's improvement in knowledge, and much more likely to inspire him with an ardour for learning. In a private education, with whatever assiduity and tenderness you labour to render learning agreeable to your pupil, still it will be but an irksome task. You may confine him to his books but for a very short space in the course of the day, and allow him an alternation of study and recreation. Still, however, you will never be able to render his books the favourite objects of his attention. He will apply to them with reluctance and careless indifference: even while he seems engaged on his lesson, his mind will be otherwise occupied; it will wander to the scenes where he pursues his diversions, and to those objects which have attracted his desires. If the period during which you require his application be extremely short; during the first part of it, he will still be thinking of the amusements from which you have called him, and regretting his confinement; during the last, he will fondly anticipate the moment when he is to be set at liberty, and think of new amusements. Again, if you confine him during a longer period, still more unfavourable effects will follow. Peevishness, dulness, and a determined aversion to all that bears the name of literature, will

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be naturally impressed on his mind by such treatment. How can it be otherwise? Books possess so few of those qualities which recommend any object to the attention of children, that they cannot be naturally agreeable. They have nothing to attract and detain the eye, the ear, or any of the senses; they present things with which children are unacquainted, and of which they know not the value: children cannot look beyond the letters and words, to the things which these represent; and even though they could, yet is it much more pleasing to view scenes and objects as they exist originally in nature, than to trace their images in a faint and imperfect representation. It is vain, therefore, to hope that children will be prevailed with to pay attention to books by means of any allurements which books can of themselves present. Other means must be used; but those in a private education you cannot command. In a public seminary, the situation of masters with respect to their pupils is widely different. When a number of boys meet together in the same school, each of them soon begins to feel the impulse of a principle which enables the master to command their attention without difficulty, and prompts them to apply with cheerful ardour to tasks which would otherwise be extremely irksome. This principle is a generous emulation, which animates the breast with the desire of superior excellence, without inspiring envy or hatred of a competitor. When children are prudently managed in a great school, it is impossible for them not to feel its impulse. It renders their tasks scarce less agreeable than their amusements, and directs their activity and curiosity to proper objects. View the scholar at a public school, composing his theme, or turning over his dictionary; how alert! how cheerful! how indefatigable! He applies with all the eagerness, and all the perseverance, of a candidate for one of the most honourable places in the temple of fame. Again, behold and pity that poor youth who is confined to his chamber with no companion but his tutor; none whose superiority can provoke his emulation, or whose inferiority might flatter him with thoughts of his own excellence, and thus move him to preserve by industrious application the advantages which he has already gained. His book is before him; but how languid, how listless his posture! how heavy and dull his eye! Nothing is expressed in his countenance but dejection or indignation. Examine him concerning his lesson; he replies with confusion and hesitation. After a few minutes observation, you cannot fail to be convinced that he has spent his time without making any progress in learning; that his spirits are now broken, his natural cheerfulness destroyed, and his breast armed with invincible prejudices against all application in the pursuit of literary knowledge. Besides, in a school there is something more than emulation to render learning less disagreeable than it naturally is to children. The slightest observation of life, or attention to our own conduct in various circumstances, will be sufficient to convince us, that whenever mankind are placed in circumstances of diffidence, or subjected to any disagreeable restraint, that which a single person bears with impatience or dejection will make a much less impression on his mind if a number of companions be joined with him in his suffering or restraint. It is esteemed a piece of much greater severity to confine a prisoner

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in a solitary cell, than when he is permitted to mix with others in the same uncomfortable situation. A journey appears much less tedious to a party of travellers, than to him who beats the path alone. In the same manner, when a number of boys in a great school are all busied on the same or on similar tasks, a spirit of industry and perseverance is communicated from one to another over the whole circle; each of them insensibly acquires new ardour and vigour; even though he feel not the spur of emulation, yet, while all are busy around him, he cannot remain idle. These are facts obvious to the most careless observer.

Neither are public schools so unfavourable to the virtue of their members as they have been represented to be. If the masters are men of virtue and prudence, careful to set a good example before their pupils, attentive to the particular character and behaviour of each individual among them, firm to punish obstinate and incorrigible depravity, and even to expel those who are more likely to injure the morals of others than to be reclaimed themselves, and at the same time eager to applaud and to encourage amiable and virtuous dispositions wherever they appear; under the government of such masters, a public school will not fail to be a school of virtue. There will no doubt be particular individuals among the pupils of such a seminary, whose morals may be corrupt and their dispositions vicious; but this, in all probability, will arise from the manner in which they were managed before entering the school, or from some other circumstances, rather than from their being sent for their education to a public school. Again, at a public school young people enjoy much greater advantages for preparing them to enter the world, than they can possibly be favoured with if brought up in a private and solitary manner. A great school is a miniature representation of the world at large. The objects which engage the attention of boys at a school are different from those which occupy their parents; the views of the boys are less extensive, and they are not yet capable of prosecuting them by so many base and mean arts; but, in other respects, the two scenes and the actors upon them nearly resemble each other; on both you behold contending passions, opposite interests, weakness, cunning, folly, and vice. He therefore who has performed his part on the miniature scene, has rehearsed as it were for the greater; if he has acquitted himself well on the one, he may be also expected to distinguish himself on the other; and even he who has not distinguished himself at school, at least enters the world with superior advantages when viewed in comparison with him who has spent his earlier days in the ignorance and solitude of a private and domestic education. Besides, when a number of boys meet at a public seminary of education, separated from their parents and relations; nearly of the same age, engaged in the same studies, and fond of the same amusements; they naturally contract friendships with one another which are more cordial and sincere than any that take place between persons farther advanced in life. A friendship is often formed between two boys at school which continues through life, and is productive of the happiest consequences to each of them. While at school, they mutually assist and encourage each other in their learning; and their mutual affection renders their tasks less burdensome

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denfome than they might otherwife find them. As they advance in life, their friendship ftill continues to produce happy effects on their sentiments and conduct: perhaps they are mutually ufeful to each other by intereft or by perfonal affiftance in making their way in the world; or when they are engaged in the cares and bufle of life, their intercourfe and correpondence with each other may contribute much to confole them amid the vexations and fatigues to which they may be expofed.

Such are the chief arguments ufually adduced in favour of a public education. When we compare them with thofe which have been urged to recommend a private education, we will perhaps find that each has its peculiar advantages. A public education is the more favourable to the acquisition of knowledge, to vigour of mind, and to the formation of habits of induftry and fortitude. A private education, when judiciously conducted, will not fail to be peculiarly favourable to innocence and to mildnefs of difpofition; and notwithstanding what has fometimes been advanced by the advocates for a public education, it is furely better to keep youth at a diftance from the feductions of vice till they be fufficiently armed againft them, than to expofe them to them at an age when they know not to what dangers they lead, and are wholly unable to refift them. Were we to give implicit credit to the fpecious talk of the two parties, either a private or a public education would form characters more like to angels than to thofe men whom we ordinarily meet in the world: but they fpeak with the ardour of enthufiafts; and therefore we muft liften with caution both to the facts which they adduce, and to the inferences which they draw. Could we, without expofing children to the contagion of a great town, procure for them the advantages of both a public and a private education at the fame time, we would by this means probably fucceed beft in rendering them both refpectable fcholars and good men. If we may prefume to give our opinion freely, we would advife parents never, except when fome unavoidable neceffity of circumftances obliges them, to expel their children from under their own roof till they be advanced beyond their boyifh years: let the mother nurfe her own child; let her and the father join in fupervifing its education: they may then expect to be rewarded, if they have acted their parts aright, by commanding the gratitude, the affection, and the refpect of their child, while he and they continue to live together. Let matters be fo ordered, that the boy may refide in his father's houfe, and at the fame time attend a public fchool: but let the girl be educated wholly under her mother's eye.

X. On Travel.

ANOTHER queftion which has been often difcuffed comes here under our review. The philofophers of ancient Greece travelled in fearch of knowledge. Books were then fcarce, and thofe few which were to be obtained were no very rich treafuries of ufe-ful information. The rhapsodies of a poet, the rude legends of fome ill-informed and fabulous hiftorian, or the theories of fanciful philofophers, were all that they could afford. Thales, Lycurgus, Solon, Plato, travelled, feeking that knowledge among more civilized

nations which they could not find in their native country. In the courfe of their travels, they heard the lectures of celebrated philofophers; confulted the priefts, who were the guardians of the traditions of antiquity, concerning the nature and origin of thofe traditions; and obferved the inftitutions of thofe nations which were moft renowned for the wifdom of their legiflature. When they fet out to vifit foreign countries, they feem to have propofed to themfelves a certain end; and by keeping that end fteadily in view during the courfe of their travels, they gained fuch improvement as to be able on their return to command the veneration of their countrymen by means of the knowledge which they were enabled to communicate. Many befides the philofophers of ancient Greece have travelled for improvement, and have fucceeded in their views. But ancient hiftory does not relate to us, that travelling was confidered by the Greeks or Romans as neceffary to finifh the education of their young men of fortune before they entered the fcenes of active life. It is true, after Greece became a province of the Roman empire, and the Romans began to admire the fcience and elegance of Greece, and to cultivate Grecian literature, the young noblemen of Rome often repaired to Rhodes and Athens to complete their ftudies under the mafters of philofophy and eloquence who taught in thofe cities. But they went thither with the fame views with which our youth in modern times are fent to free fchools and univerfities, not to acquire knowledge by the obfervation of nature, of the inftitutions, manners, and cuftoms of nations; but merely to hear lectures, read books, and perform exercifes. In modern times, a few men of reflection and experience have now and then travelled for improvement: but the greateft part of our travellers, for a long time, were enthufiaftic devotees who went in pilgrimage to vifit the fhrine or relics of fome favourite faint; foldiers, who wandered over the earth to deftroy its inhabitants; or merchants, whose bufinefs as factors between widely diftant countries and nations led them to brave every danger in travelfing from one corner of the globe to another. But fince the nations of modern Europe have begun to emerge from rudenefs, ignorance, and fervile depreflion, they have formed one great commonwealth, the members of which are fcarcelefs intimately connected with each other than were the ftates of ancient Greece. The confequence of this mutual connection and dependence is, that almoft all the nations of Europe have frequent intercourfe with one another; and as fome of them are and have long been more enlightened and refined than others, thofe nations who have attained the higheft degrees of civilization and refinement have naturally attracted the admiration and homage of the reft. Their language has been ftudied, their manners and arts have been adopted, and even their drefs has been imitated. Other nations have thronged to pay the homage due to their fuperior merit, and to ftudy under them as mafters. Hence has arifen the praftice which at prefent prevails among us of fending our youth to complete their education by travelling, before we introduce them to active life, or require them to engage in bufinefs. Formerly young men were not fent to travel till after they had proceeded through the forms of a regular education, and had at leaft attained fuch an age that they were no longer

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Education. to be considered as mere boys. But the progress of luxury, the desire of parents to introduce their children into the world at an early age that they may early attain to wealth and honours, and various other causes, have gradually introduced the practice of sending mere boys to foreign countries, under pretence of affording them opportunities of shaking off prejudices, of storing their minds with truly useful knowledge, and of acquiring those graceful manners and that manly address which will enable them to acquit themselves in a becoming manner when they are called to the duties of active life. How much travelling at such an early age contributes to fulfil the views of parents, a slight survey of the senate-house, the gambling-houses, the race-course, and the cockpit, will readily convince the sagacious observer.

But we wish to foster no prejudices against neighbouring nations; we entertain no such prejudices in favour of Britain, as to wish to confine our countrymen within the sea-girt isle. Let us inquire, what advantages may be gained by travelling, and at what age it may be most proper to set out in pursuit of those advantages.

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Travel necessary to the acquisition of knowledge.

After all that bookish men have urged, and notwithstanding all that they may continue vehemently to urge, in behalf of the knowledge to be derived from their beloved books; it must still be acknowledged, that books can teach us little more than merely the language of men. Or, if we should grant that books are of higher importance, and that language is the least valuable part of the knowledge which they teach, yet still we need to beware that they lead us not astray; it is better to examine nature with the naked eye, than to view her through the spectacles of books. Neither the theories or experiments of philosophers, nor the narratives of travellers, nor the relations of historians, though supported by a numerous train of authorities, are worthy of implicit credit. You retire from the world, confine yourself for years to your closet, and read volume after volume, historians, philosophers, and poets; at last you fancy that you have gained an immense store of knowledge: But leave your retirement, return into the world, compare the knowledge which you have treasured up with the appearances of nature; you will find that you have laboured in vain, that it is only the semblance of knowledge which you have acquired, and will not serve for a faithful guide in life, nor even enable you to distinguish yourself for literary merit. Compare the relations of travellers with one another; how seldom do they agree when they describe the same scenes and the same people! Turn your attention to the most respectable historians, compare their accounts of the same events; what disagreement! what contrariety! Where shall truth be found? Listen to the cool, the candid philosophers; what contradictory theories do they build on the same system of facts!

We agree, then, that it is better to seek knowledge by actual observation and experiment, than to receive it at second-hand from the information of others. He who would gain an acquaintance with the beauties of external nature, must view them with his own eyes; he who would know the operations of the human understanding, must reflect upon what passes in his own mind; he who would know the customs, opinions,

and manners of any people, must mingle with them, Education. must observe their conduct, and listen to their conversation. The arts are acquired by actual practice; the sciences by actual observation in your own person, and by deducing inferences from your observations.

If therefore to extend our knowledge can contribute in any degree to render us happier, wiser, or better; travelling, as being more favourable to knowledge than the study of books, must be highly advantageous. Get well acquainted with your own country; with the manners, the customs, the laws, and the political situation of your countrymen: Get also a knowledge of books; for books would not be altogether useless, though they could serve no other purpose but to teach us the language in which mankind express themselves: And then, if your judgment have attained maturity; if curiosity prompt you; if your constitution be robust and vigorous, and your spirits lively; you may imitate the Solons, Homers, and Platos of old, and visit foreign countries in search of knowledge, and with a view to bring home something which may be of real utility to yourself and your country. You will, by this time, be so much master of the language of your own country, that you will not lose it while you are learning the languages of foreign nations; your principles of taste and of right and wrong will be so formed and fixed, that you will not despise any institution or custom or opinion merely because it prevails not in your own country; nor yet will you be ready to admire and adopt any thing, merely because it prevails among a foreign nation who are distinguished for profound and extensive knowledge, or for elegance of taste and manners. No; you will divest yourself of every prejudice, and judge only by the fixed unalterable principles which determine the distinction between right and wrong, between truth and falsehood, between beauty and deformity, sublimity and meanness. Your object will not be to learn exotic vices, to mingle in frivolous amusements, or to form a catalogue of sins. Your views, your inquiries, will have a very different direction. You will attend to the state of the arts, of the sciences, of morals, manners, and government; you will also contemplate with eager delight, the grand or beautiful scenes of nature, and examine the vegetable productions of the various regions through which you pass, as well as the different tribes of animals which inhabit them; you will observe what blessings the beneficence of nature has conferred on the inhabitants of each particular division of the globe, and how far the ingenuity and industry of man have taken advantage of the kindness of nature. Thus surveying the face of the earth, and considering how advantages and disadvantages are balanced with each other through every various region and climate from one extremity of the globe to another; you will admire and revere that impartiality with which the Author of nature has distributed his benefits to the whole human race. When from the chilly climes and stubborn soil of the north, you turn your eyes to the fertile, genial regions of the south, where every tree is loaded with exquisite fruits, and every vegetable is nourishing and delicious; you will be pleased to find, that the inhabitants of the north, by their superior ingenuity and vigour, are able to raise themselves to circumstances

Education. no less comfortable and respectable than those which the nations inhabiting between the tropics enjoy: when you behold the French shaking off the yoke of despotism, and aspiring to the sweets of liberty as well as their British neighbours; you will be pleased to see, that the natural gaiety and cheerfulness of the former nation render them not incapable of the energy of the latter. You will be pleased to view the remains of antiquity, and the noble monuments of art; but you will think it below you to trifle away your time in gazing at palaces and churches, and collecting rusty medals and fragments of marble; you will seek the society of eminent men, and eagerly cultivate an acquaintance with the most distinguished artists and men of science who adorn the nations among whom you may happen to sojourn: Knowing that the knowledge which is to be acquired in great towns, is by no means an adequate compensation for the vicious habits which you are liable to contract in them; and besides, that the luxuries, the arts, the manners, the virtues, and the vices of all great towns are nearly the same, so that when you have seen one, you have seen all others; you will avoid taking up your residence for any considerable time in any of the great towns through which you have occasion to pass in the course of your travels. The traveller who has attained the previous accomplishments which we have mentioned as necessary, who sets out with the views which we have supposed him to entertain, and who conducts his travels in this manner, cannot fail to return home enriched with much useful knowledge; he cannot but derive more real improvement from travelling, than he could have gained by spending the same period of time in solitary study: when he returns to his native country, he will appear among his countrymen as more than a philosopher; a sage, and a benefactor. His knowledge is so extensive and accurate, his views are so liberal and enlarged, and he is so superior to prejudices, without being the enemy of any useful establishments, that he will be enabled to command universal esteem, by performing his part in life with becoming dignity and propriety, and perhaps to render his name illustrious, and his memory dear to future times, by some important services to the community to which he belongs, or even to mankind in general.

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Circumstances that render travelling unprofitable to the youth of the present age.

But though we have thus far, and we hope for obvious and solid reasons, decided in favour of travelling, as being more likely than a solitary application to books, to furnish the mind with useful and ornamental knowledge; yet we do not see that our British youth either take care to furnish themselves with the previous knowledge which we consider as indispensably necessary in order to prepare them for travelling with advantage, or set out with proper views, or prosecute their travels in a prudent, judicious manner. After receiving a very imperfect education, in which religious and moral instruction are almost wholly neglected, and no means are used to inspire the youthful mind with solid, virtuous, manly qualities; but every art is tried to make the young man appear learned, while his mind is destitute of all useful information, and to teach him to assume the confidence of manhood before he has attained even to a moderate degree of sense and prudence;—after an education conducted

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Education. in this manner, and with these views, the stripling is sent abroad to view the world, and is expected to return home a finished character, an ornament and a comfort to his parents and all his connections. He is hitherto unacquainted, perhaps, even with the simple events of the history of his native country; and either totally ignorant of classical literature, or but very superficially instructed in it. He has not yet viewed with a discerning eye the manners and customs prevailing among his countrymen; he knows not the nature of the government under which he lives, nor the spirit of those laws by which his civil conduct must be regulated. He has no fixed principles; no clear, distinct views. But to supply all his wants of this nature, he is put into the hands of a travelling governor, who is to be entirely submissive to his will, and yet to serve him both for eyes and intellect. This governor is generally either some macaroni officer who is considered as well bred, and thought to know the world; or else, perhaps, some cringing son of literature, who having spent much time among his books, without acquiring such strength or dignity of mind as to raise him above frivolity of manners and conversation or pitiful fawning arts, is therefore regarded as happily qualified for this important charge. This respectable personage and his pupil are shipped off for France, that land of elegant dissipation, frivolity, and fashion. They travel on with eager impatience till they reach the capital. There the young man is industriously introduced to all the gay scenes which Paris can display. He is, at first, confounded; by and by his senses are fascinated; new desires are awakened in his breast; all around him he sees the sons of dissipation wallowing in debauchery, or the children of vanity fluttering about like so many gawdy insects. The poor youth has no fixed principles: he has not been taught to regard vanity as ridiculous, or to turn from vice with abhorrence. No attempt is made to allure him to those objects, an attention to which can alone render travelling truly beneficial. Hitherto his mind had been left almost wholly uncultivated; and now, the seeds of vice are plentifully sown in it. From one great town he is conveyed to another, till he visit almost every place in Europe where profligacy of manners has attained to any uncommon height. In this happy course of education he probably continues to pursue improvement till he is well acquainted with most of the post-roads, the principal inns, and the great towns at least in France and Italy; and perhaps till he has worn out his constitution, and rendered his mind totally incapable of any generous sentiments or sober reflection. He then revisits his native country, to the inexpressible happiness of his parents, who now eagerly long to embrace their all-accomplished child. But how miserably are the poor folks disappointed, when they find his constitution wasted, his understanding uninformed, his heart destitute of every manly or generous sentiment; and perceive him to possess no accomplishment, but such as are merely superficial? Perhaps, however, his parents are prevented by their partiality both for their child and for the means which they have adopted in conducting his education, from viewing his character and qualifications in a true light. Perhaps they overlook all his defects, or

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Education. consider them as ornaments, and regard their dear son as the mirror of perfection. But, unfortunately, though they be blind to the hideous deformity of the monster which they have formed, they cannot hinder it from being conspicuous to others; though they may view their son's character as amiable and respectable, they cannot render it useful, they cannot prevent it from being hurtful to society. Let this youth whose education has been thus wisely conducted, let him be placed at the head of an opulent fortune, advanced to a seat in the legislative body of his country, or called to act in any public character; how will he distinguish himself? As the virtuous patriot, the honest, yet able statesman, the skilful general, or the learned, upright judge? How will he enjoy his fortune? Will he be the friend of the poor, the steady supporter of the laws and constitution under whose protection he lives? Will he show himself capable of enjoying *otium cum dignitate*? If we reason by the usual laws of probability, we cannot expect that he should; and if we observe the manners and principles of our men of wealth and high birth who have been brought up in this manner, we find our reasonings confirmed.

Such are the opinions which candid observation leads us to entertain with regard to the advantages which may be gained by travelling.

He whose mind has been judiciously cultivated, and who has attained to maturity of judgment, if he set out on his travels with a view to obtain real improvements, and persist invariably in the prosecution of that view, cannot but derive very great advantage from travelling.

But again, those young men whose minds have not been previously cultivated by a judicious education, who set out without a view to the acquisition of real knowledge, and who wander among foreign nations, without attention to any thing but their luxuries, their follies, and their vices; those poor young men cannot gain any real improvement from their travels.

Our countrymen, who travel for improvement, do not appear to derive so much advantage from their travels as were to be wished, because they generally receive too superficial an education, set out at too early a period of life, and direct not their views to objects of real utility and importance.

XI. On Knowledge of the World, and Entrance into Life.

MUCH has been said concerning the utility of a knowledge of the world, and the advantage of acquiring it at an early period of life. But those who have the most earnestly recommended this knowledge of the world, have generally explained themselves in so inaccurate a manner concerning it, that it is difficult to understand what ideas they affix to it. They seem to wish, that, in order to acquire it, young people may be early made acquainted with all the vices and follies of the world, introduced into polite company, carried to public places, and not confined even from the gaming-table and the stew. Some knowledge of the world may, no doubt, be gained by these means. But it is surely dearly purchased; nor are the advantages which can be derived from it so considerable, as to tempt the judicious and affectionate parent to expose his child to the infection of vanity, folly, and vice, for

their fake. Carry a boy or girl into public life at the age of fourteen or fifteen; show them all the scenes of splendid vanity and dissipation which adorn London or Paris; tell them of the importance of dress, and of the ceremonies of good breeding and the forms of intercourse; teach them that fashionable indifference and assurance which give the *ton* to the manners of our fine gentlemen and fine ladies of the present age. What effects can you expect the scenes into which you introduce them, and the mysteries which you now teach them, to produce on the minds of the children? They have a direct tendency to inspire them with a taste for vanity, frivolity, and dissipation. If you wish them to be like the foolish, the dissipated, and the gay, you are likely to obtain your purpose; but if, on the contrary, your views are to prepare them for discharging the duties of life, you could not adopt more improper means: for though they be well acquainted with all those things on which you place so much value, yet they have not thereby gained any accession of useful knowledge. They are not now more able than before to eliminate the real value of objects; nay, their judgment is now more liable than before to be misled in estimating the value of the objects around them. Luxury, vanity, and fashion, have stamped on many things an ideal value. By mingling at an early age in those scenes of the world where luxury, vanity, and fashion reign with arbitrary sway, young people are naturally impressed with all those prejudices which these have a tendency to inspire. Instead of acquiring a useful knowledge of the world, they are rendered incapable of ever viewing the world with an unprejudiced and discerning eye. If possible, therefore, we should rather labour to confine young people from mingling in the scenes of gay and dissipated life till after they have attained maturity of age and judgment. They will then view them in a proper light, and perhaps be happy enough to escape the infectious contagion of vice.

But there is another and a more valuable knowledge ^{9x} What of the world, which we ought industriously to communicate to them as soon as they are capable of receiving it. As soon as they are made thoroughly acquainted with the distinctions between right and wrong, between virtue and vice, between piety and impiety, and have become capable of entering into our reasonings; we ought then to inform them concerning the various establishments and institutions which exist in society; concerning the customs, opinions, and manners of mankind; and concerning the various degrees of strength or weakness of mind, of ingenuity or dullness, of virtuous or vicious qualities, which discriminate those characters which appear in society. We ought also to seize every opportunity which may be presented of exemplifying our lessons by instances in real life. We must point out to them those circumstances which have led mankind to place an undue value on some objects, while they appreciate others much below their real utility and importance. Thus let us fortify their judgments against that impression which the dazzling novelty of the scene, and the force of passion, will be apt to produce; and communicate to them a knowledge of the world, without exposing them imprudently to the contagion of its vices and follies.

When at length the period arrives at which they must

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must be emancipated from subjection, and committed to the guidance of their own conscience and reason, and of those principles which we have laboured to inculcate on their minds; let us warn them of the dangers to which they are about to be exposed; tell them of the glory and the happiness to which they may attain; inspire them, if possible, with disdain for folly, vanity, and vice, whatever dazzling or enchanting forms they may assume; and then dismiss them to enrich their minds with new stores of knowledge by visiting foreign nations; or, if that should be inconvenient, to enter immediately on the duties of some useful employment in active life.

EDUCORATION, properly signifies the rendering substances more mild. Chemical edulcoration consists almost always in taking away acids and other saline substances; and this is effected by washing the bodies to which they adhere in a large quantity of water. The washing of diaphoretic antimony, powder of argoph, &c. till the water comes off quite pure and insipid, are instances of chemical edulcoration.—In pharmacy, juleps, potions, and other medicines, are said to be *edulcorated*, by adding sugar or syrup.

EDWARD, the name of several kings of England. See (*History of*) ENGLAND.

EDWARDS (George), fellow of the royal and antiquarian societies, was born at Stratford, a hamlet belonging to Welham in Essex, on the 3d of April 1694. After having spent some time at school, he was put apprentice to a tradesman in Fenchurch-street. His master, who was eminent both for his piety and skill in the languages, treated him with great kindness; but about the middle of his apprenticeship, an accident happened which totally put a stop to the hopes of young Edwards's advancing himself in the way of trade. Dr Nicolas, a person of eminence in the physical world, and a relation of his master's, happened to die. The Doctor's books were removed to an apartment occupied by Edwards, who eagerly employed all his leisure-hours, both in the day and great part of the night, in perusing those which treated of natural history, sculpture, painting, astronomy, and antiquities. The reading of these books entirely deprived him of any inclination for mercantile business he might have formerly had, and he resolved to travel into foreign countries. In 1716, he visited most of the principal towns in Holland, and in about a month returned to England. Two years after, he took a voyage to Norway, at the invitation of a gentleman who was disposed to be his friend, and who was nephew to the master of the ship in which he embarked. At this time Charles XII. was besieging Frederic shall; by which means our young naturalist was hindered from making such excursions into the country as otherwise he would have done, for the Swedes were very careful to confine such strangers as could not give a good account of themselves. But notwithstanding all his precaution, he was confined by the Danish guard, who supposed him to be a spy employed by the enemy to get intelligence of their designs. However, by obtaining testimonials of his innocence, a release was granted. In 1718 he returned to England, and next year visited Paris by the way of Dieppe. During his stay in this country he made two journeys of 100 miles each; the first to Chalons in Champagne, in May 1720; the second on foot, to Orleans and Blois: but an edict

happening at that time to be issued for securing vagrants, in order to transport themselves to America, as the banks of the Mississippi wanted population; our author narrowly escaped a western voyage. On his arrival in England, Mr Edwards closely pursued his favourite study of natural history, applying himself to drawing and colouring such animals as fell under his notice. A strict attention to natural, more than picturesque beauty, claimed his earliest care: birds first engaged his particular attention; and having purchased some of the best pictures of these subjects, he was induced to make a few drawings of his own; which were admired by the curious, who encouraged our young naturalist to proceed, by paying a good price for his early labours. Among his first patrons and benefactors may be mentioned James Theobalds, Esq; of Lambeth; a gentleman zealous for the promotion of science. Our artist, thus unexpectedly encouraged, increased in skill and assiduity; and procured, by his application to his favourite pursuit, a decent subsistence and a large acquaintance. However, he remitted his industry in 1731; when, in company with two of his relations, he made an excursion to Holland and Brabant, where he collected several scarce books and prints, and had an opportunity of examining the original pictures of several great masters at Antwerp, Brussels, Utrecht, and other cities. In December 1733, by the recommendation of the great Sir Hans Sloane, Bart. president of the college of physicians, he was chosen librarian, and had apartments in the college. This office was peculiarly agreeable to his taste and inclination, as he had the opportunity of a constant recourse to a valuable library, filled with scarce and curious books on the subjects of natural history, which he so assiduously studied. By degrees he became one of the most eminent ornithologists in this or any other country. His merit is so well known in this respect, as to render any eulogium on his performances unnecessary: but it may be observed, that he never trusted to others what he could perform himself; and often found it so difficult to give satisfaction to his own mind, that he frequently made three or four drawings to delineate the object in its most lively character, attitude, and representation. In 1743, the first volume of the *History of Birds* was published in quarto. His subscribers exceeding even his most sanguine expectations, a second volume appeared in 1747. The third volume was published in 1750. In 1751, the fourth volume came from the press. This volume being the last he intended to publish at that time, he seems to have considered it as the most perfect of his productions in natural history; and therefore devoutly offered it up to the great God of nature, in humble gratitude for all the good things he had received from him in this world. Our author, in 1758, continued his labours under a new title, viz. *Gleanings of Natural History*. A second volume of the *Gleanings* was published in 1760. The third part, which made the seventh and last volume of his works, appeared in 1764. Thus our author, after a long series of years, the most studious application, and the most extensive correspondence to every quarter of the world, concluded a work which contains engravings and descriptions of more than 600 subjects in natural history, not before described or delineated. He likewise added a general index in French and English; which was afterwards perfected, with the Linnæan names,

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by that great naturalist Linnaeus himself, who frequently honoured him with his friendship and correspondence. Some time after Mr Edwards had been appointed library-keeper to the royal college of physicians, he was, on St Andrew's day, in the year 1750, presented with an honorary compliment by the president and council of the royal society, with the gold medal, the donation of Sir Godfrey Copley, Bart. annually given on that day to the author of any new discovery in art or nature, in consideration of his natural history just then completed. A copy of this medal he had afterwards engraved, and placed under the title in the first volume of his history. He was a few years afterwards elected fellow of the royal society, and of the society of antiquaries, London; and also a member of many of the academies of sciences and learning in different parts of Europe. In compliment to these honorary distinctions from such learned bodies, he presented elegant coloured copies of all his works, to the royal college of physicians, the royal society, the society of antiquarians, and to the British museum; also to the royal academy of sciences at Paris, from whom he received the most polite and obliging letter of thanks by their then secretary Monsieur Desouchy. His collection of drawings, which amounted to upwards of 900, were purchased by the earl of Bute. They contain a great number of British as well as foreign birds, and other animals hitherto not accurately delineated or described. After the publication of the last work, being arrived at his 70th year, he found his sight begin to fail, and his hand lost its wonted steadiness. He retired from public employment to a little house which he purchased at Plaitow; previous to which, he disposed of all the copies, as well as plates, of his works. The conversation of a few select friends, and the perusal of a few select books, were the amusement of the evening of his life; and now and then he made an excursion to some of the principal cities in England, particularly to Bristol, Bath, Exeter, and Norwich. Some years before his death, the alarming depredations of a cancer, which baffled all the efforts of physical skill, deprived him of the sight of one of his eyes: he also suffered much from the stone, a complaint to which at different periods of his life he had been subject. Yet it has been remarked, that, in the severest paroxysms of misery, he was scarcely known to utter a single complaint. Having completed his 80th year, emaciated with age and sickness, he died on the 23d of July 1773, deplorably lamented by a numerous acquaintance.

EDYSTONE LIGHT-HOUSE, lying off Plymouth harbour, was first erected by the corporation of the Trinity-house in 1696; in consideration of which, the masters, &c. of English shipping agreed to pay one penny a ton outwards and inwards. It was demolished by the storm of 1703, and re-erected by act of parliament in the 4th of queen Anne, and the same duty on tonnage of ships granted for its support; which law was enforced in the 8th of June. It has been since destroyed and rebuilt.

ECKHOUT (Gerbrant Vander), history and portrait painter, was born at Amsterdam in 1621, and was a disciple of Rembrandt; whose manner of designing, colouring, and penciling, he imitated so nearly, that it is difficult to distinguish between several of his paintings and those of his master. He painted after na-

ture, and with such a force as only nature can equal: his touch and his colouring are the fames Rembrandt's; but he rather excelled him in the extremities of his figures. His principal employment was for portraits; and in those he was admirable: but he surpassed all his cotemporaries, in the power he had of painting the mind in the countenance. But although Eckhout painted portraits to so great a degree of perfection, yet was he much more pleased to paint historical subjects, and he executed them with equal success. In that style his composition is rich and full of judgment; the distribution of his masses of light and shadow is truly excellent; and in the opinion of many connoisseurs, he had more transparency in his colouring, and better expression, than his master. He died in 1674.

EEL, in ichthyology, a species of *MURENA*.

EEL-Fishing. See **BOBBING** and **SNIGGLING**.

The silver-eel may be caught with several sorts of baits, as powdered-beef, garden-worms, minnows, hens-guts, fish-garbage, &c. The most proper time for taking them is in the night, fastening your line to the bank sides, with your laying-hook in the water: or a line may be thrown with good store of hooks, baited and plumbed, with a float to discover where the line lies, that they may be taken up in the morning.

Microscopic EELS. See **ANIMALCULE**, n° 8.

EELS in Vinegar, are similar to those in four paste. The taste of vinegar was formerly thought to be occasioned by the biting of these little animals, but that opinion has been long ago exploded. Menzelius says, he has observed the actual transformation of these little creatures into flies: but as this hath never been observed by any other person, nor is there an instance of such a transformation in any other animalcule, it seems probable that Menzelius hath been mistaken in his observations.

EEL-Spear, a forked instrument with three or four jagged teeth, used for catching of eels: that with the four teeth is best, which they strike into the mud at the bottom of the river, and if it strike against any eels it never fails to bring them up.

EFFARE, or **EFFRAYE**, in heraldry, a term applied to a beast rearing on its hind-legs, as if it were frightened or provoked.

EFFECT, in a general sense, is that which results from, or is produced by, any cause. See **CAUSE**.

EFFEMINATE, womanish, unmanly, voluptuous.

EFFEMINATE (*effeminati*), according to the vulgate, are mentioned in several places of scripture. The word is there used to signify such as were consecrated to some profane god, and prostituted themselves in honour of him. The Hebrew word *kadesh*, translated *effeminatus*, properly signifies consecrated, and hence was attributed to those of either sex, who publicly prostituted themselves in honour of Baal and Astarte. Moses expressly forbids these irregularities among the Israelites; but the history of the Jews shows, that they were notwithstanding frequently practised. Levit. xxiii. 18.

EFFENDI, in the Turkish language, signifies master: and accordingly it is a title very extensively applied; as, to the mufti and emirs, to the priests of mosques, to men of learning, and of the law. The grand chancellor of the empire is called *reis-effendi*.

EFFERVESCENCE, an intestine motion excited betwixt the parts of two bodies of different natures, when

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Efflorescence.

when they reciprocally dissolve each other. Effervescences are commonly attended with bubbles, vapours, small jets of the liquid, and a hissing noise; and these phenomena are occasioned by the air which at that time disengages itself. Sometimes also they are accompanied with a great degree of heat, the cause of which is not so well known.

Formerly the word *fermentation*, was also applied to effervescences; but now that word is confined to the motion naturally excited in animal and vegetable matters, and from which new combinations among their principles take place.

EFFIGY, the portrait, figure, or exact representation of a person.

EFFIGY, is also used for the print or impression of a coin, representing the prince's head who struck it.

EFFIGY, to execute or degrade in, denotes the execution or degradation of a condemned contumacious criminal, who cannot be apprehended or seized. In France, they hang a picture on a gallows or gibbet, wherein is represented the criminal, with the quality or manner of the punishment: at the bottom is written the sentence or condemnation. Such persons as are sentenced to death are executed in effigy.

EFFLORESCENCE, among physicians, the same with exanthema. See EXANTHEMA.

EFFLORESCENCE, in chemistry, denotes the formation of a kind of mealy powder on the surface of certain bodies. Efflorescence is occasioned either by decomposition or drying. The efflorescence which happens to cobalt and martial pyrites is of the first; and that observed on the crystals of marine alkali, Glauber's salt, &c. of the latter kind. An efflorescence is sometimes also a species of crystallization, the nature of which is not well understood; as, the beautiful vegetations which shoot up from vitriolated tartar acidulated either with the vitriolic or nitrous acids, the saline spiculae which are observed to shoot from salt butter, &c.

Besides the common crystallization of salts, all of them have the property of appearing in the form of an efflorescence, or small saline spiculae, when mixed with any thick substance, particularly lime. Whatever salt happens to be made use of, there is little or no difference in the efflorescence. Thus, in butter very much salted, the sea-salt shoots in the form of long spiculae, though the sea-salt itself never shoots but in the form of cubical crystals. In like manner, Glauber's salt will appear in the form of an efflorescence, as well as the fossil alkali, &c. nor will the form of the crystals of the efflorescence be perceptibly different from those of sea-salt. The efflorescences which we see very commonly upon walls are in general Glauber's salt. In some cases (but seldom in such efflorescences as we have examined) they are composed of fossil alkali. The reason of these differences is not known. In almost all cases of this kind there seems to be a real growth of salt. On one spot of a plaster wall about two feet square, which we observed particularly, this growth was very evident. The produce was a true Glauber's salt; and by frequently taking off the efflorescence, eight ounces were procured; nor did the prolific virtue of the wall seem to be in the least impaired by the waste.

EFFLORESCENTIA, in botany, (from *effloresco* to bloom), the precise time of the year and month in which every plant shows its first flowers.

Some plants flower twice a-year, as is common between the tropics; others oftener, as the monthly rose. The former are called by botanists *bifera*; the latter, *multifera*.

The time of flowering is determined by the degree of heat which each species requires. Mezeron and snow-drop produce their flowers in February; primrose, in the beginning of March; the greater number of plants, during the month of May; corn, and other grain, in the beginning of June; the vine, in the middle of the same month; several compound flowers, in the months of July and August; lastly, meadow-saffron flowers in the month of October, and announces the speedy approach of winter.

Grafts of *Parnassius* always flowers about the time of cutting down the hay; and in Sweden, the different species of thistle, mountain-lettuce, succory, and balsam, seldom flower till after the summer solstice: the country-men even know, as by a kalendar, that the solstice is past when these plants begin to produce their flowers.

The temperature of the seasons has a mighty influence both in accelerating and retarding the flowering of plants. All plants are earlier in warm countries; hence such as are cultivated out of their native soil, never flower till the heat of the climate, or situation in to which they are removed, is equal to that under the influence of which they produced flowers in their own country. For this reason, all exotics from warm climates are later in this country than many plants which it naturally produces.

In general, we may observe, that the plants of the coldest countries, and those produced on the mountains in all climates, being of equal temperature, flower about the same time, viz. during our spring in Europe.

Plants that grow betwixt the tropics, and those of temperate climates, flower during our summer.

Plants of temperate climates, situated under the same parallel of latitude with certain parts of Europe, but removed much farther to the west, such as Canada, Virginia, and Mississippi, do not produce flowers till autumn.

Plants of temperate climates in the opposite hemisphere to Europe, flower during our winter, which is the summer of these regions.

Linnaeus and Adanson have given a sketch of the different times in which plants flower at Upsal and Paris.

EFFLUVIUM, in physiology; a term much used by philosophers and physicians, to express the minute particles which exhale from moist, if not all, terrestrial bodies, in form of insensible vapours.

EFFRONTES, in church-history, a sect of heretics, in 1534, who scraped their forehead with a knife till it bled, and then poured oil into the wound. This ceremony served them instead of baptism. They are likewise said to have denied the divinity of the Holy Spirit.

EFFUSION, the pouring out of any liquid thing with some degree of force. In the ancient heathen sacrifices

Efflorescentia
Effluen.

Effusion
of
Egg.

crifices there were divers effusions of wine and other liquors, called *libations*.

EFFUSION, or FUSION, in astronomy, denotes that part of the sign Aquarius, represented on celestial globes and planispheres, by the water issuing out of the urn of the water-bearer.

EFT, in zoology, the English name of the common lizard. See LACERTA.

EGERIA, or ÆGERIA, a nymph held in great veneration by the Romans. She was courted by Numa Pompilius; and according to Ovid, he became his wife. This prince frequently visited her; and that he might introduce his laws and new regulations into the state, he solemnly declared before the Roman people, that they were previously sanctified and approved by the nymph Egeria. Ovid says, that Egeria was so disconsolate at the death of Numa, that she melted into tears, and was changed into a fountain by Diana. She is reckoned by many as a goddess who presided over the pregnancy of women; and some maintain that she is the same as Lucina.

EGG, in physiology, a body formed in certain females, in which is contained an embryo or fetus of the same species, under a cortical surface or shell. The exterior part of an egg is the shell; which in a hen, for instance, is a white, thin, and friable cortex, including all the other parts. The shell becomes more brittle by being exposed to a dry heat. It is lined every where with a very thin but a pretty tough membrane, which dividing at, or very near, the obtuse end of the egg, forms a small bag, where only air is contained. In new-laid eggs this follicle appears very little, but becomes larger when the egg is kept.

Within this are contained the albumen or white, and the vitellus or yolk; each of which have their different virtues.

The albumen is a cold, viscous, white liquor in the egg, different in consistence in its different parts. It is observed, that there are two distinct albumens, each of which is inclosed in its proper membrane. Of these one is very thin and liquid: the other is more dense and viscous, and of a somewhat whiter colour; but, in old and stale eggs, after some days incubation, inclining to a yellow. As this second albumen covers the yolk on all sides, so it is itself surrounded by the other external liquid. The albumen of a fecundated egg, is as sweet and free from corruption, during all the time of incubation, as it is in new-laid eggs; as is also the vitellus. As the eggs of hens consist of two liquors separated one from another, and distinguished by two branches of umbilical veins, one of which goes to the vitellus, and the other to the albumen; so it is very probable that they are of different natures, and consequently appointed for different purposes.

When the vitellus grows warm with incubation, it becomes more humid, and like melting wax or fat; whence it takes up more space. For as the fetus increases, the albumen insensibly wastes away and condenses: the vitellus, on the contrary, seems to lose little or nothing of its bulk when the fetus is perfected, and only appears more liquid and humid when the abdomen of the fetus begins to be formed.

The chick in the egg is first nourished by the albumen; and when this is consumed, by the vitellus, as

with milk. If we compare the chalazæ to the extremities of an axis passing through the vitellus, which is of a spherical form, this sphere will be composed of two unequal portions, its axis not passing through its centre; consequently, since it is heavier than the white, its smaller portion must always be uppermost in all positions of the egg.

The yellowish white round spot, called *cicatrícula*, is placed on the middle of the smaller portion of the yolk; and therefore, from what has been said in the last paragraph, must always appear on the superior part of the vitellus.

Not long before the exclusion of the chick, the whole yolk is taken into its abdomen; and the shell, at the obtuse end of the egg, frequently appears cracked some time before the exclusion of the chick. The chick is sometimes observed to perforate the shell with its beak. After exclusion, the yolk is gradually swallowed, being conveyed into the small-guts by a small duct.

Eggs differ very much according to the birds that lay them, as to their colour, form, bigness, age, and the different way of dressing them: those most used in food are hens eggs; of which, such as are new-laid are best.

As to the preservation of eggs, it is observed that the egg is always quite full when it is first laid by the hen; but from that time it gradually becomes less and less so, to its decay: and however compact and close its shell may appear, it is nevertheless perforated with a multitude of small holes, though too minute for the discernment of our eyes, the effect of which is a daily decrease of matter within the egg, from the time of its being laid; and the perspiration is much quicker in hot weather than in cold.

To preserve the egg fresh, there needs no more than to preserve it full, and stop its transpiration; the method of doing which is, by stopping up those pores with matter which is not soluble in watery fluids: and on this principle it is, that all kinds of varnish, prepared with spirit of wine, will preserve eggs fresh for a long time, if they are carefully rubbed all over the shell: tallow, or mutton fat, is also good for this purpose; for such as are rubbed over with this, will keep as long as those coated over with varnish.

Artificial Method of Hatching Eggs. See HATCHING.

EGINA. See ÆGINA.

EGINHART, secretary to the emperor Charles the Great, was a German. He is the most ancient historian of that nation, and wrote very eloquently for a man of the 9th century. It is said, that he insinuated himself so well into the favour of Emma, daughter to Charles the Great, that he obtained from her whatever he desired. Charles the Great, having found out the intrigue, did not do as Augustus, who is thought to have banished Ovid because he believed him to be too much favoured by Julia; for he married the two lovers together, and gave them a fine estate in land.

EGLANTINE, in botany. See ROSA.

EGLON, a king of the Moabites, who oppressed the Israelites for 18 years (Judges iii. 12—14.) Calmet confounds this servitude of the Hebrews with that under Chusan-rushathaim, making it to subsist only eight years, from the year of the world 2591 to 2599; whereas

Egg
of
Egdon.

Egra
Egypt.

whereas this servitude under Eglon lasted 18 years, and commenced in the year of the world 2661, and 62 years after they had been delivered by Othniel from the subjection of Chushan-rushathaim.

EGRA, a town of Bohemia, formerly imperial, but now subject to the house of Austria. It contains a great number of able artificers, and is famous for its mineral waters. Wallenstein, the emperor's general, was assassinated here in 1634. The French became masters of this town in 1741; but afterwards being blocked up, they were forced to capitulate on September 7th, 1743. It is looked upon as a town of the greatest consequence in Bohemia, except Prague. It is seated on a river of the same name, in E. Long. 12. 30. N. Lat. 50. 21.

EGRET, in ornithology, a species of ardea. See ARDEA.

EGYPT, an extensive country of Africa, lying between 30° and 36° of east longitude, and between 21° and 31° of north latitude. It is bounded by the Mediterranean on the north; by the Red-sea and Isthmus of Suez, which divide it from Arabia, on the east; by Abyssinia or Ethiopia, on the south; and by the deserts of Barca and Nubia, on the west; being 600 miles in length from north to south, and from 100 to 200 in breadth from east to west.

Y
Different
names.

As a nation, the Egyptians may with justice lay claim to as high antiquity as any in the world. The country was most probably peopled by Mizraim the son of Ham and grandson of Noah.—By its ancient inhabitants it was called *Chemia*, and is still called *Chemi* in the language of the *Copts* or native Egyptians; and this name it is supposed to have received from Ham the son of Noah. In scripture, we find it most generally named *Mizraim*; though in the Psalms it is styled the *land of Ham*.—To us it is best known by the name *Egypt*, the etymology of which is more uncertain.—Some derive it from *Egyptus*, a supposed king of the country: others say it signifies no more than “the land of the *Copts*”; *Asia* in Greek signifying a country, and *Aegyptos* being easily softened into *Egyptus*.—The most probable opinion, however, seems to be, that it received this name from the blackness of its soil, and the dark colour both of its river and inhabitants: for such a blackish colour is by the Greeks called *egyptior* from *gypte*, and *gypte* “a vulture;” and by the Latins, *subvolitarius*. For the same reason, other names of a similar import have been given to this country by the Greeks; such as *Aeria*, and *Melambolus*: the river itself was called *Melo* or *Melas*; by the Hebrews, *Shibor*; and by the Ethiopians, *Siris*; all of which signify “black.”

Ancient Egypt is by some divided into two parts, the Upper and Lower Egypt: by others into three, the Upper Egypt, properly so called, or *Thebais*; the Middle Egypt, or *Heptanomis*; and the Lower Egypt, the best part of which was the *Delta*, or that space encompassed by the branches of the Nile. See THEBAIS, &c.

The Egyptians, like the Chinese, pretend to an excessive antiquity, pretending to have records for ten, twenty, or even fifty thousand years. Thus their history is so much involved in obscurity and fable, that for many ages it must be passed over in silence.—The first mortal king whom the Egyptians own to have reigned in that country, was *Menes* or *Menas*. At

what time he reigned, it would be to very little purpose to inquire. He had been preceded, however, by a set of immortals, who it seems left him the kingdom in a very bad situation: for the whole country, except Thebais, was a morass; the people also were entirely destitute of religion, and every kind of knowledge which could render their life comfortable and happy. Menes diverted the course of the Nile, which before that time had washed the foot of a sandy mountain near the borders of Libya, built the city of Memphis, instructed his subjects, and did other things of a similar kind which are usually attributed to the founders of kingdoms.

From the time of Menes, the Egyptian chronology is filled with a list of 330 kings, who reigned 1400 the shepherds. The first herds.

distinct piece of history we find concerning Egypt, is the irruption of the *Shepherds*, by whom the country was subdued; but whether this revolution happened during the vast interval of indolence above mentioned, or before or after, cannot be known. The affair is thus related by Manetho. It happened, in the reign of Timaus king of Egypt, that God being displeased with the Egyptians, they suffered a great revolution: for a multitude of men, ignoble in their race, took courage, and, pouring from the east into Egypt, made war with the inhabitants; who submitted to them without resistance. The shepherds, however, behaved with the greatest cruelty; burnt the cities, threw down the temples of the gods, and put to death the inhabitants, carrying the women and children into captivity. This people came from Arabia, and were called *Hyksos*, or *king-shepherds*. They held Egypt in subjection for 259 years; at the end of which period, they were obliged by a king of Upper Egypt, named *Amosis*, or *Thothmes*, to leave the country. This prince's father had, it seems, gained great advantages over them, and shut them up in a place called *Abaris*, or *Avaris*, containing 10,000 acres of land. Here they were closely besieged by Amosis, with an army of 400,000 men; but at last the king, finding himself unable to reduce them by force, proposed an agreement, which was readily accepted. In consequence of this agreement, the shepherds withdrew from Egypt with their families, to the number of 240,000; and, taking the way of the desert, entered Syria; but fearing the Assyrians, who were then very powerful, and masters of Asia, they entered the land of Judaea, and built there a city capable of holding so great a multitude, and called it *Jerusalem*.

According to Mr Bruce, the shepherds who invaded Egypt were no other than the inhabitants of Barbary. They were, he says, *carriers* to the Cushites who lived farther to the south. The latter had built the many stately temples in Thebes and other cities of Egypt; though, according to him, they had no dwelling-places but holes or caves in the rocks. Being a commercial people, they remained at home collecting and preparing their articles, which were dispersed by the *barabers* or shepherds already mentioned. These, from the nature of their employment, lived in moveable habitations, as the Tartars do at this day. By the Hebrews, he tells us, they were called *plut*, but *shepherds* by every other people; and from the name *baraber*, the word *Barbary* is derived. By their employment, which was the dispersing the Arabian and African goods all over

Egypt.

over the continent, they had become a great and powerful people; and from their opposite dispositions and manners, became very frequently enemies to the Egyptians. To one Salatis our author ascribes the destruction of Thebes in Upper Egypt, so much celebrated by Homer for its magnificence. But this certainly cannot be the case; for Homer wrote long after the time of Joseph: and we find that even then the Egyptians had the shepherds in abhorrence, in all probability because they had been grievously oppressed by them. Mr Bruce counts three invasions of these people; the first, that of Salatis already mentioned, who overthrew the first dynasty of Egyptian kings from Menes, and destroyed Thebes: the second was that of Sabacco or So; for according to him this was not the name of a single prince, but of a people, and signifies *shepherds*: and the third, after the building of Memphis, where 240,000 of them were besieged as above mentioned. But accounts of this kind are evidently inconsistent in the highest degree; for how is it possible that the *third* invasion, antecedent to the building of Jerusalem, could be posterior to the *second*, if the latter happened only in the days of Hezekiah?

In these early ages, however, it would seem that the kingdom of Egypt had been very powerful and its dominion very widely extended; since we find it said, that the *Badrrians* revolted from Osymandyas, another Egyptian king of very high antiquity, and of whose wealth the most marvellous accounts are given.

After an unknown interval of time from this monarch, reigned Sesostris. He was the first great warrior whose conquests are recorded with any degree of distinctness. In what age of the world he lived, is uncertain. Some chronologers, among whom is Sir Isaac Newton, are of opinion, that he is the Sefac or Shihak, who took Jerusalem in the reign of Rehoboam the son of Solomon. Others, however, place him much earlier; and Mr Whiston will have him to be the Pharaoh who refused to part with the Israelites, and was at last drowned in the Red Sea. Mr Bryant endeavours to prove that no such person ever existed; but that in his history, as well as that of many ancient heroes, we have an abridgement of that of the Cushites or Babylonians, who spread themselves over great part of the known world, and every where brought the people in subjection to them. His reign is reckoned the most extraordinary part of the Egyptian history; and the following seems to be the least fabulous account that can be got of it. The father of Sesostris was told in a dream, by the god Vulcan, that his son, who was then newly born, or perhaps still unborn, should be lord of the whole earth. His father, upon the credit of this vision, got together all the males in the land of Egypt that were born on the same day with Sesostris; appointed nurses and proper persons to take care of them, and had them treated like his own child; being persuaded that they who had been the constant companions of his youth would prove the most faithful ministers and soldiers. As they grew up, they were inured to laborious exercises; and, in particular, were never permitted to taste any food till they had performed a course of 180 furlongs, upwards of 22 of our miles. When the old king imagined they were sufficiently educated in the martial way he desired them to follow, they were sent by way

Egypt.

of trial of their abilities against the Arabians. In this expedition Sesostris proved successful, and in the end subdued that people who had never before been conquered. He was sent to the westward, and conquered the greatest part of Africa; nor could he be stopped in his career till he arrived at the Atlantic ocean. Whilst he was on this expedition, his father died; and then Sesostris resolved to fulfil the prediction of Vulcan, by actually conquering the whole world. As he knew that this must take up a long time, he prepared for his journey in the best manner possible. The kingdom he divided into 36 provinces, and endeavoured to secure the affections of the people by gifts both of money and land. He forgave all who had been guilty of offences, and discharged the debts of all his soldiers. He then constituted his brother Arais the supreme regent; but forbade him to use the diadem, and commanded him to offer no injury to the queen or her children, and to abstain from the royal concubines. His army consisted of 600,000 foot, 24,000 horse, and 27,000 chariots. Besides these land-forces, he had at sea two mighty fleets; one, according to Diodorus, of 400 sail. Of these fleets, one was designed to make conquests in the west, and the other in the east; and therefore the one was built on the Mediterranean and the other on the Red Sea. The first of these conquered Cyprus, the coast of Phœnicia, and several of the islands called *Cyclades*: the other conquered all the coasts of the Red Sea; but its progress was stopped by shoals and difficult places which the navigators could not pass, so that he seems not to have made many conquests by sea.

With the land-forces Sesostris marched against the Ethiopians and Troglodites; whom he overcame, and obliged them to pay him a tribute of gold, ebony, and ivory. From thence he proceeded as far as the promontory of Diræ, which lay near the straits of Babel-mandel, where he set up a pillar with an inscription in sacred characters. He then marched on to the country where cinnamon grows, or at least to some country where cinnamon at that time was brought, probably some place in India; and here he in like manner set up pillars, which were to be seen for many ages after. As to his farther conquests, it is agreed by almost all authors of antiquity, that he over-ran and pillaged the whole continent of Asia, and some part of Europe. He crossed the Ganges, and erected pillars on its banks; and from thence he is said to have marched eastward to the very extremity of the Asiatic continent. Returning from thence, he invaded the Scythians and Thracians; but all authors do not agree that he conquered them. Some even affirm, that he was overthrown by them with great slaughter, and obliged to abandon a great part of his booty and military stores. But whether he had good or bad success in these parts, it is a common opinion that he settled a colony in Colchis. Herodotus, however, who gives the most particular account of the conquests of this monarch, does not say whether the colony was designedly planted by Sesostris; or whether part of his army loitered behind the rest, and took up their residence in that region. From his own knowledge, he asserts, that the inhabitants of that country were undoubtedly of Egyptian descent. This was evident from the personal resemblance they bore to the Egyptian

^{Egypt} tians, who were fwarthy-complexioned and frizzled-haired; but more especially from the conformity of their customs, particularly circumcision.

The utmost boundary of this mighty monarch's conquests, however, was in the country of Thrace; for beyond this country his pillars were no where to be seen. These pillars he was accustomed to set up in every country which he conquered, with the following inscription, or one to the same purpose: "Sesoftris, king of kings, and lord of lords, subdued this country by the power of his arms." Besides these, he left also statues of himself; two of which, according to Herodotus, were to be seen in his time; the one on the road between Ephesus and Phocæa, and the other between Smyrna and Sardis: they were armed after the Ethiopian and Egyptian manner, holding a javelin in one hand and a bow in the other. Across the breast they had a line drawn from one shoulder to the other, with the following inscription; "This region I obtained by these my shoulders." They were mistaken for images of Memnon.

³
Returns to
Egypt.

The reasons given by Sesoftris for his returning into Egypt from Thrace, and thus leaving the conquest of the world unfinished, were the want of provisions for his army, and the difficulty of the passes. Most probably, however, his return was hastened by the intelligence he received from the high priest of Egypt, concerning the rebellious proceedings of his brother; who, encouraged by his long absence, had assumed the diadem, violated the queen, and also the royal concubines. On receiving this news, Sesoftris hastened from Thrace; and at the end of nine years came to Pelusium in Egypt, attended by an innumerable multitude of captives taken from many different nations, and loaded with the spoils of Asia. The treacherous brother met him at this city; and it is said, with very little probability, that Sesoftris accepted of an invitation to an entertainment from him. At this he drank freely, together with the queen and the rest of the royal family. During the continuance of the entertainment, Armais caused a great quantity of dried reeds to be laid round the apartment where they were to sleep; and as soon as they were retired to rest set fire to the reeds. Sesoftris perceiving the danger he was in, and that his guards, overcharged with liquor, were incapable of assisting him, rushed through the flames, and was followed by his wife and children. In thanksgiving for this wonderful deliverance, he made several donations to the gods, particularly to Vulcan the god of fire. He then took vengeance on his brother Armais, said to be the Danaus of the Greeks, who, being on this occasion driven out of Egypt, withdrew into Greece.

⁴
His great
works.

Sesoftris now laid aside all thoughts of war, and applied himself wholly to such works as might tend to the public good, and his own future reputation. In order to prevent the incursions of the Syrians and Arabians, he fortified the east side of Egypt with a wall which ran from Pelusium through the desert to Heliopolis, for 187½ miles. He raised also an incredible number of vast and lofty mounds of earth, to which he removed such towns as had before been situated too low, in order to secure them from the inundations of the Nile. All the way from Memphis to the sea he dug canals which branched out from the Nile; and not

only made an easier communication between different places, but rendered the country in a great measure impassable to any enemy. He erected a temple in every city in Egypt, and dedicated it to the supreme deity of the place; but in the course of such a great undertaking as this necessarily must have been, he took care not to employ any of his Egyptian subjects. Thus he secured their affection, and employed the vast multitude of captives he had brought along with him; and to perpetuate the memory of a transaction so remarkable, he caused to be inscribed on all these temples,

^{Egypt}

"No one native laboured hereon." In the city of Memphis, before the temple of Vulcan, he raised six gigantic statues, each of one stone. Two of them were 30 cubits high, representing himself and his wife; the other four were 20 cubits each, and represented his four sons. These he dedicated to Vulcan in memory of his above mentioned deliverance. He raised also two obelisks of marble 120 cubits high, and charged them with inscriptions, denoting the greatness of his power, his revenues, &c.

The captives taken by Sesoftris are said to have been treated with the greatest barbarity; so that at last they resolved at all events to deliver themselves from a servitude so intolerable. The Babylonians particularly were concerned in this revolt, and laid waste the country to some extent; but being offered a pardon and a place to dwell in, they were pacified, and built for themselves a city which they called *Babylon*. Towards the conquered princes who waited on him with their tribute, the Egyptian monarch behaved with unparalleled insolence. On certain occasions he is said to have unharnessed his horses, and, yoking kings together, made them draw his chariot. One day, however, observing one of the kings who drew his chariot to look back upon the wheels with great earnestness, he asked what made him look so attentively at them? The unhappy prince replied, "O king, the going round of the wheel puts me in mind of the vicissitudes of fortune: for as every part of the wheel is uppermost and lowermost by turns, so it is with men; who one day sit on a throne, and on the next are reduced to the vilest degree of slavery." This answer brought the insulting conqueror to his senses; so that he gave over the practice, and thenceforth treated his captives with great humanity. At length this mighty monarch lost his sight, and laid violent hands on himself.

⁵
His death.

After the death of Sesoftris, we meet with another chasm of an indeterminate length in the Egyptian history. It concludes with the reign of Amasis or Amosis; who being a tyrant, his subjects joined Actisanes the king of Ethiopia to drive him out.—Thus Actisanes became master of the kingdom; and after his death follows another chasm in the history, during which the empire is said to have been in a state of anarchy for five generations.—This period brings us down to the times of the Trojan war. The reigning prince in Egypt was at that time called *Cetes*; by the Greeks, *Proteus*. The priests reported that he was a magician; and that he could assume any shape he pleased, even that of fire. This fable, as told by the

⁶
Origin of
the fable of
the Egyptians, perhaps introduced by Proteus. They were Proteus, used to adorn and distinguish the heads of their kings with the representations of animals or vegetables, or even

Egypt.
7
Arrival of
Paris and
Helen in
Egypt.

even with burning incense, in order to strike the beholders with the greater awe. Whilst Proteus reigned, Paris or Alexander, the son of Priam king of Troy, was driven by a storm on the coast of Egypt, with Helen, whom he was carrying off from her husband. But when the Egyptian monarch heard of the breach of hospitality committed by Paris, he seized him, his mistrefs, and companions, with all the riches he had brought away with him from Greece. He detained Helen, with all the effects belonging to Menelaus her husband, promising to restore them to the injured party whenever they were demanded; but commanded Paris and his companions to depart out of his dominion in three days, on pain of being treated as enemies. In what manner Paris afterwards prevailed upon Proteus to restore his mistrefs, we are not told; neither do we know any thing further of the transactions of this prince's reign nor of his successors, except what has entirely the air of fable, till the days of Sabbaco the Ethiopian, who again conquered this kingdom. He began his reign with an act of great cruelty, causing the conquered prince to be burnt alive: nevertheless, he no sooner saw himself firmly established on the throne of Egypt, than he became a new man; so that he is highly extolled for his mercy, clemency, and wisdom. He is thought to have been the So mentioned in scripture, and who entered into a league with Hoshea king of Israel against Shalmaneser king of Assyria. He is said to have been excited to the invasion of Egypt by a dream or vision, in which he was assured, that he should hold that kingdom for 50 years. Accordingly, he conquered Egypt, as had been foretold; and at the expiration of the time above mentioned, he had another dream, in which the tutelar god of Thebes acquainted him, that he could no longer hold the kingdom of Egypt with safety and happiness, unless he massacred the priests as he passed through them with his guards. Being haunted with this vision, and at the same time abhorring to hold the kingdom on such terms, he sent for the priests, and acquainted them with what seemed to be the will of the gods. Upon this it was concluded, that it was the pleasure of the Deity that Sabbaco should remain no longer in Egypt; and therefore he immediately quitted that kingdom, and returned to Ethiopia.

8
Egypt con-
quered by
Sabbaco.

9
Remark-
able story
of Sethon.

Of *Amfias*, who was Sabbaco's immediate successor, we have no particulars worth notice. After him reigned one Sethon, who was both king and priest of Vulcan. He gave himself up to religious contemplation; and not only neglected the military class, but deprived them of their lands. At this they were so much incensed, that they entered into an agreement not to bear arms under him; and in this state of affairs Sennacherib king of Assyria arrived before Pelusium with a mighty army. Sethon now applied to his soldiers, but in vain: they unanimously persisted in refusing to march under his banner. Being therefore destitute of all human aid, he applied to the god Vulcan, and requested him to deliver him from his enemies. Whilst he was yet in the temple of that god, it is said he fell into a deep sleep; during which, he saw Vulcan standing at his side, and exhorting him to take courage. He promised, that if Sethon would but go out against the Assyrians, he should obtain a complete victory over them. Encouraged by this assurance, the king assem-

bled a body of artificers, shop-keepers, and labourers; and, with this undisciplined rabble, marched towards Pelusium. He had no occasion, however, to fight; for the very night after his arrival at Pelusium, an innumerable multitude of field-rats entering the enemies' camp, gnawed to pieces the quivers, bowstrings, and shield-straps. Next morning, when Sethon found the enemy disarmed, and on that account beginning to fly, he pursued them to a great distance, making a terrible slaughter. In memory of this extraordinary event, a statue of Sethon was erected in the temple of Vulcan, holding in one hand a rat, and delivering these words: "Whosoever beholdeth me, let him be pious."

Soon after the death of Sethon, the form of government in Egypt was totally changed. The kingdom was divided into twelve parts, over which as many of the chief nobility presided. This division, however, subsisted but for a short time. Psammithichus, one of the twelve, dethroned all the rest, 15 years after the division had been made. The history now begins to be divested of fable; and from this time may be accounted equally certain with that of any other nation. The vast conquests of Sesostris were now no longer known; for Psammithichus possessed no more than the country of Egypt itself. It appears, indeed, that none of the successors of Sesostris, or even that monarch himself, had made use of any means to keep in subjection the countries he had once conquered. Perhaps, indeed, his design originally was rather to *pillage* than to conquer; and therefore, on his return, his vast empire vanished at once. Psammithichus, however, endeavoured to extend his dominions by making war on his neighbours; but by putting more confidence in foreign auxiliaries than in his own subjects, the latter were so much offended, that upwards of 200,000 fighting men emigrated in a body, and took up their residence in Ethiopia.—To repair this loss, Psammithichus earnestly applied himself to the advancement of commerce; and opened his ports to all strangers, whom he greatly caressed, contrary to the cruel maxims of his predecessors, who refused to admit them into the country. He also laid siege to the city of Azotus in Syria, which held out for 29 years against the whole strength of the kingdom; from which we may gather, that, as a warrior, Psammithichus was by no means remarkable. He is reported to have been the first king of Egypt that drank wine. He also sent to discover the springs of the Nile; and is said to have attempted to discover the most ancient nation in the world by the following method. Having procured two newly born children, he caused them to be brought up in such a manner that they never heard a human voice. He imagined that these children would naturally speak the original language of mankind; therefore, when, at two years of age, they pronounced the Phrygian word *beccos* (or some found resembling it), which signifies bread, he concluded that the Phrygians were the most ancient people in the world.

Nechus, the son and successor of Psammithichus, is reported to have been a prince of an enterprising and warlike genius. In the beginning of his reign, he attempted to cut through the isthmus of Suez, between the Red-Sea and the Mediterranean; but, through the invincible obstacles which nature has thrown in the way of such undertakings, he was obliged

Egypt.

10
Reign of
Psammithichus.

11
Succeeded
by Nechus.

Egypt.

ged to abandon the enterprize, after having lost 120,000 men in the attempt. After this he sent a ship, manned with some expert Phœnician mariners, on a voyage to explore the coasts of Africa. Accordingly, they performed the voyage; sailed round the continent of Africa; and after three years returned to Egypt, where their relation was deemed incredible.

72
His wars
with Josiah
and Nebu-
chadnezzar.

The most remarkable wars in which this king was engaged, are recorded in the sacred writings. He went out against the king of Assyria, by the divine command, as he himself told Josiah; but being opposed by this king of Judæa, he defeated and killed him at Megiddo; after which he set up, in that country, king Jehoiaakim, and imposed on him an annual tribute of 100 talents of silver and one talent of gold. He then proceeded against the king of Assyria; and weakened him so much, that the empire was soon after dissolved. Thus he became master of Syria and Phœnicia; but in a short time, Nebuchadnezzar king of Babylon came against him with a mighty army. The Egyptian monarch, not daunted by the formidable appearance of his antagonist, boldly ventured a battle; but was overthrown with prodigious slaughter, and Nebuchadnezzar became master of all the country to the very gates of Pelusium.

13
Apries a
martial and
successful
prince.

The reign of Apries, the *Pharaoh-Hophra* of Scripture, presents us with a new revolution in the Egyptian affairs. He is represented as a martial prince, and in the beginning of his reign very successful. He took by storm the rich city of Sidon; and having overcome the Cypriots and Phœnicians in a sea-fight, returned to Egypt laden with spoil. This success probably incited Zedekiah king of Judæa to enter into an alliance with him against Nebuchadnezzar king of Babylon. The bad success of this alliance was foretold by the prophet Jeremiah; and accordingly it happened. For Nebuchadnezzar having set down with his army before Jerusalem, Apries marched from Egypt with a design to relieve the city; but no sooner did he perceive the Babylonians approaching him, than he retreated as fast as he could, leaving the Jews exposed to the rage of their merciless enemies; who were thereupon treated as Jeremiah had foretold; and by this step Apries brought upon himself the vengeance denounced by the same prophet.—The manner in which these predictions were fulfilled is as follows: The Cyrenæans, a colony of the Greeks, being greatly strengthened by a numerous supply of their countrymen under their third king *Batis* styled *the Happy*, and encouraged by the Pythian oracle, began to drive out their Libyan neighbours, and share their possessions among themselves. Hereupon Andican king of Libya sent a submissive embassy to Apries, and implored his protection against the Cyrenæans. Apries complied with his request, and sent a powerful army to his relief. The Egyptians were defeated with great slaughter; and those who returned complained that the army had been sent off by Apries in order to be destroyed, and that he might tyrannize without controul over the remainder of his subjects. This thought catching the attention of the giddy multitude, an almost universal defection ensued. Apries sent one Amasis, a particular friend, in whom he thought he could confide, to bring back his people to a sense of their duty. But by this friend he was betrayed; for Amasis, taking the op-

14
Bad con-
sequences of
his alliance
with Zedekiah.

15
His subjects
revolt.

Egypt.

portunity of the present ferment, caused himself to be proclaimed king. Apries then dispatched one Patarbemis, with orders to take Amasis, and bring him alive before him. This he found impossible, and therefore returned without his prisoner; at which the king was so enraged, that he commanded Patarbemis's nose and ears to be cut off. This piece of cruelty completed his ruin; for when the rest of the Egyptians who continued faithful to Apries beheld the inhuman mutilation of so worthy and noble a person as Patarbemis was, they to a man deserted Apries, and went over to Amasis.

Both parties now prepared for war; the usurper having under his command the whole body of native Egyptians; and Apries only those Ionians, Carians, and other mercenaries whom he could engage in his service. The army of Apries amounted only to 30,000; but, though greatly inferior in number to the troops of his rival, as he well knew that the Greeks were much superior in valour, he did not doubt of victory. Nay, so far was Apries puffed up with this notion, that he did not believe it was in the power even of any God to deprive him of his kingdom. The two armies soon met, and drew up in order of battle near Memphis. A bloody engagement ensued; in which, though the army of Apries behaved with the greatest resolution, they were at last overpowered with numbers, and utterly defeated, the king himself being taken prisoner. Amasis now took possession of the throne without opposition. He confined Apries in one of his palaces, but treated him with great care and respect. The people, however, were implacable, and could not be satisfied while he enjoyed his life. Amasis, therefore, at last found himself obliged to deliver him into their hands. Thus the prediction received its final completion: Apries was delivered up to those *who fought his life*; and who no sooner had him in their power, than they strangled him, and laid his body in the sepulchre of his ancestors.

16
Apries de-
feated and
taken pri-
soner by
Amasis.

During these intestine broils, which must have greatly weakened the kingdom, it is probable that Nebuchadnezzar invaded Egypt. He had been for 13 years before this employed in besieging Tyre, and at last had nothing but an empty city for his pains. To make himself some amends, therefore, he entered Egypt, miserably harassed the country, killed and carried away great numbers of the inhabitants, so that the country did not recover from the effects of this incursion for a long time after. In this expedition, however, he seems not to have aimed at any permanent conquest, but to have been induced to it merely by the love of plunder, and of this he carried with him an immense quantity to Babylon.

17
Egypt in-
vaded by
Nebuchad-
nezzar.

During the reign of Amasis, Egypt is said to have been perfectly happy, and to have contained 20,000 populous cities. That good order might be kept among such vast numbers of people, Amasis enacted a law, by which every Egyptian was bound once a-year to inform the governor of his province by what means he gained his livelihood; and if he failed of this, to put him to death. The same punishment he decreed to those who could not give a satisfactory account of themselves.

18
Happy ad-
ministra-
tion of
Amasis.

This monarch was a great favourite of the Greeks, and married a woman of Grecian extract. To many

Egypt.

Greek cities, as well as particular persons, he made considerable presents. Beside these, he gave leave to the Greeks in general to come into Egypt, and settle either in the city of Naucratis, or carry on their trade upon the sea-coasts; granting them also temples, and places where they might erect temples to their own deities. He received also a visit from Solon the celebrated Athenian lawgiver, and reduced the island of Cyprus under his subjection.

19
Offends
Cambyses
king of
Persia,

This great prosperity, however, ended with the death of Amasis, or indeed before it. The Egyptian monarch had some how or other incensed Cambyses king of Persia. The cause of the quarrel is uncertain; but whatever it was, the Persian monarch vowed the destruction of Amasis. In the mean time Phanes of Halicarnassus, commander of the Grecian auxiliaries in the pay of Amasis, took some private disgust; and leaving Egypt, embarked for Persia. He was a wife and able general, perfectly well acquainted with every thing that related to Egypt; and had great credit with the Greeks in that country. Amasis was immediately sensible how great the loss of this man would be to him, and therefore sent after him a trusty eunuch with a swift galley. Phanes was accordingly overtaken in Lycia, but not brought back; for, making his guard drunk, he continued his journey to Persia, and presented himself before Cambyses, as he was meditating the destruction of the Egyptian monarchy.

20
And Poly-
crates ty-
rant of
Samos.

At this dangerous crisis also, the Egyptian monarch imprudently made Polycrates the tyrant of Samos his enemy. This man had been the most remarkable perhaps of any recorded in history, for an uninterrupted course of success, without the intervention of one single unfortunate event. Amasis, who was at this time in strict alliance with Polycrates, wrote him a letter, in which, after congratulating him on his prosperity, he told him that he was afraid lest his successes were too many, and he might be suddenly thrown down into the greatest misery. For this reason he advised him voluntarily to take away something from his own happiness; and to cast away that which would grieve him most if he was accidentally to lose it. Polycrates followed his advice, and threw into the sea a signet of inestimable value. This, however, did not answer the intended purpose. The signet happened to be swallowed by a fish, which was taken a few days afterwards, and thus was restored to Polycrates. Of this Amasis was no sooner informed, than, considering Polycrates as really *unhappy*, and already on the brink of destruction, he resolved to put an end to the friendship which subsisted between them. For this purpose he dispatched an herald to Samos, commanding him to acquaint Polycrates, that he renounced his alliance, and all the obligations between them; that he might not mourn his misfortunes with the sorrow of a friend. Thus Amasis left Polycrates at liberty to act against him, if he chose to do so; and accordingly he offered to assist Cambyses with a fleet of ships in his Egyptian expedition.

Amasis had not, however, the misfortune to see the calamities of his country. He died about 525 years before Christ, after a reign of 44 years; and left the kingdom to his son Psammennitus, just as Cambyses was approaching the frontiers of the kingdom. The new prince was scarce seated on the throne, when the Per-

sians appeared. Psammennitus drew together what forces he could, in order to prevent them from entering the kingdom. Cambyses, however, immediately laid siege to Pelusium, and made himself master of it by the following stratagem: he placed in the front of his army a great number of cats, dogs, and other animals that were deemed sacred by the Egyptians. He then attacked the city, and took it without opposition; the garrison, which consisted entirely of Egyptians, not daring to throw a dart or shoot an arrow against their enemies, lest they should kill some of the holy animals.

Cambyses had scarce taken possession of the city, when Psammennitus advanced against him with a numerous army. But before the engagement, the Greeks who served under Psammennitus, to show their indignation against their treacherous countryman Phanes, brought his children into the camp, killed them in the presence of their father and of the two armies, and then drank their blood. The Persians, enraged at so cruel a sight, fell upon the Egyptians with the utmost fury, put them to flight, and cut the greatest part of them in pieces. Those who escaped fled to Memphis, where they were soon after guilty of a horrid outrage. Cambyses sent a herald to them in a ship from Mitylene: but no sooner did they see her come into the port, than they flocked down to the shore, destroyed the ship, and tore to pieces the herald and all the crew; afterwards carrying their mangled limbs into the city, in a kind of barbarous triumph. Not long after, they were obliged to surrender; and thus Psammennitus fell into the hands of his inveterate enemy, who was now enraged beyond measure at the cruelties exercised upon the children of Phanes, the herald, and the Mitylenian sailors.

The rapid success of the Persians struck with such terror the Libyans, Cyrenaeans, Barcæans, and other dependants or allies of the Egyptian monarch, that they immediately submitted. Nothing now remained but to dispose of the captive king, and revenge on him and his subjects the cruelties which they had committed. This the merciless victor executed in the severest manner. On the 10th day after Memphis had been taken, Psammennitus and the chief of the Egyptian nobility were ignominiously sent into one of the suburbs of that city. The king being there seated in a proper place, saw his daughter coming along in the habit of a poor slave with a picher to fetch water from the river, and followed by the daughters of the greatest families in Egypt, all in the same miserable garb, with pichers in their hands, drowned in tears, and loudly bemoaning their miserable situation. When the fathers saw their daughters in this distress, they burst into tears, all but Psammennitus, who only cast his eyes on the ground and kept them fixed there. After the young women, came the son of Psammennitus, with 2000 of the young nobility, all of them with bits in their mouths and halters round their neck, led to execution. This was done to expiate the murder of the Persian herald and the Mitylenian sailors; for Cambyses caused ten Egyptians of the first rank to be publicly executed for every one of those that had been slain. Psammennitus, however, observed the same conduct as before, keeping his eyes steadfastly fixed on the ground, though all the Egyptians around him made the loudest lamentations.

Egypt.

22
Cruelty and
defeat of
the Egypt-
ians.

23
Their
dreadful
punishment
by Camby-
ses.

24
Egypt in-
vaded by
Cambyses.

Egypt

Egypt.

tions. A little after this he saw an intimate friend and companion, now advanced in years, who having been plundered of all he had, was begging his bread from door to door in the suburbs. As soon as he saw this man, Pflammenitus wept bitterly; and calling out to him by his name, struck himself on the head as if he had been frantic. Of this the spies who had been set over him to observe his behaviour, gave immediate notice to Cambyfes, who thereupon sent a messenger to inquire the cause of such immoderate grief. Pflammenitus answered, That the calamities of his own family confounded him, and were too great to be lamented by any outward signs of grief; but the extreme distress of a bosom friend gave more room for reflection, and therefore extorted tears from him. With this answer Cambyfes was so affected, that he sent orders to prevent the execution of the king's son; but these came too late, for the young prince had been put to death before any of the rest. Pflammenitus himself was then sent for into the city, and restored to his liberty: and had he not showed a desire of revenge, might perhaps have been trusted with the government of Egypt; but being discovered hatching schemes against the government, he was seized, and condemned to drink bull's blood.

24
Egypt be-
comes a
province of
the Persian
and after-
wards of
the Grecian
empire.

The Egyptians were now reduced to the lowest degree of slavery. Their country became a province of the Persian empire: the body of Amasis their late king was taken out of his grave; and after being mangled in a shocking manner, was finally burnt. But what seemed more grievous than all the rest, their god Apis was slain, and his priests ignominiously scourged; and this inspired the whole nation with such an hatred to the Persians, that they could never afterwards be reconciled to them. As long as the Persian empire subsisted, the Egyptians could never shake off their yoke. They frequently revolted indeed, but were always overthrown with prodigious loss. At last they submitted, without opposition, to Alexander the Great: after his death, Egypt again became a powerful kingdom; though since the conquest of it by Cambyfes to the present time, it hath never been governed but by foreign princes, agreeable to the prophecy of Ezekiel, "There shall be no more a prince of the land of Egypt."

25
Assigned to
Ptolemy
Lagus, who
assumes the
title of
king.

On the death of Alexander the Great, Egypt, together with Libya, and that part of Arabia which borders on Egypt, were assigned to Ptolemy Lagus as governor under Alexander's son by Roxana, who was but newly born. Nothing was farther from the intention of this governor, than to keep the provinces in trust for another. He did not, however, assume the title of *king*, till he perceived his authority so firmly established that it could not be shaken; and this did not happen till 19 years after the death of Alexander, when Antigonus and Demetrius had unsuccessfully attempted the conquest of Egypt.

From the time of his first establishment on the throne, Ptolemy, who had assumed the title of *Soter*, reigned 20 years; which added to the former 19, make up the 39 years which historians commonly allow him to have reigned alone. In the 39th year of his reign, he made one of his sons, named *Philadelphus*, partner in the empire; declaring him his successor, to the prejudice of his eldest son named *Ceraunus*; being excited thereto by

his violent love for *Berenice* Philadelphus's mother. When the succession was thus settled, Ceraunus immediately quitted the court; and fled at last into Syria, where he was received with open arms by Seleucus Nicator, whom he afterwards murdered.

The most remarkable transaction of this reign was the embellishing of the city of Alexandria, which Ptolemy made the capital of his new kingdom, and of which an account is given under the article ALEXANDRIA. About 284 years before Christ, died Ptolemy Soter, in the 41st year of his reign, and 84th of his age. He was the best prince of his race; and left behind him an example of prudence, justice, and clemency which few of his successors chose to follow. Besides the provinces originally assigned to him, he has added to his empire those of Cælo-Syria, Ethiopia, Pamphylia, Lycia, Caria, and some of the Cyclades. His successor, Ptolemy Philadelphus, added nothing to the extent of the empire; nor did he perform any thing worthy of notice except embellishing further the city of Alexandria, and entering into an alliance with the Romans. In his time, one Magas, the governor of Libya and Cyrene, revolted; and held these provinces as an independent prince, notwithstanding the utmost efforts of Ptolemy to reduce him. At last an accommodation took place; and a marriage was proposed between Berenice, the only daughter of Magas, and Ptolemy's eldest son. The young prince was to receive all her father's dominions by way of dowry, and thus they would again be brought under the dominion of Ptolemy's family. But before this treaty could be put in execution, Magas died; and then Apamea, the princess's mother, did all she could to prevent the match. This, however, she was not able to do; tho' her efforts for that purpose produced a destructive war of four years continuance with Antiochus Theus king of Syria, and the acting of a cruel tragedy in the family of the latter. See SYRIA.

About 246 years before Christ, Ptolemy Philadelphus died; and was succeeded by his eldest son Ptolemy, who had been married to Berenice the daughter of Magas, as above related. In the beginning of his reign, he found himself engaged in a war with Antiochus Theus king of Syria. From this he returned victorious, and brought with him 2500 statues and pictures, among which were many of the ancient Egyptian idols, which had been carried away by Cambyfes into Persia. These were restored by Ptolemy to their ancient temples: in memory of which favour, the Egyptians gave him the surname of *Euergetes*, or the Beneficent. In this expedition he greatly enlarged his dominions, making himself master of all the countries that lie between mount Taurus and the confines of India. An account of these conquests was given by himself, inscribed on a monument, to the following effect. "Ptolemy Euergetes, having received from his father the sovereignty of Egypt, Libya, Syria, Phœnicie, Cyprus, Lycia, Caria, and the other Cyclades, assembled a mighty army of horse and foot, with a great fleet, and elephants, out of Trogloditia and Ethiopia; some of which had been taken by his father, and the rest by himself, and brought from thence, and trained up for war; with this great force he sailed into Asia, and having conquered all the provinces which lie on this side the Euphrates, Cilicia, Pamphylia, Ionia, the Hellepont,

27
Ptolemy
Euergetes a
great con-
queror.

Egypt.

Hellefpont, and Thrace, he croſſed that river with all the forces of the conquered countries, and the kings of thoſe nations, and reduced Melopotamia, Babylo-
nia, Suſia, Perſia, Media, and all the country as far as Baſtria.”

On the king's return from this expedition, he paſſed through Jeruſalem, where he offered many ſacrifices to the God of Iſrael, and ever afterwards expreſſed a great favour for the Jewiſh nation. At this time, the Jews were tributaries to the Egyptian monarchs, and paid them annually 20 talents of ſilver. This tribute, however, Onias, who was then high-prieſt, being of a very covetous diſpoſition, had for a long time neglected to pay, ſo that the arrears amounted to a very large ſum. Soon after his return, therefore, Ptolemy ſent one of his courtiers named *Athenion* to demand the money, and deſired him to acquaint the Jews that he would make war upon them in caſe of a refusal. A young man, however, named *Joſeph*, nephew to Onias, not only found means to avert the king's anger, but even got himſelf choſen his receiver-general, and by his faithful diſcharge of that important truſt, continued in high favour with Ptolemy as long as he lived.

Ptolemy Euergetes having at laſt concluded a peace with Seleucus the ſucceſſor of Antiochus Thus king of Syria, attempted the enlargement of his dominions on the fourth ſide. In this he was attended with ſuch ſucceſs, that he made himſelf maſter of all the coaſts of the Red-Sea, both on the Arabian and Ethiopian ſides, quite down to the ſtraits of Babel-mandel. On his return he was met by ambaffadors from the Achæans, imploring his aſſiſtance againſt the Etolians and Lacedæmonians. This the king readily promiſed them: but they having in the mean time engaged Antigonus king of Macedon to ſupport them, Ptolemy was ſo much offended, that he ſent powerful ſuccours to Cleomenes king of Sparta; hoping, by that means, to humble both the Achæans and their new ally Antigonus. In this, however, he was diſappointed; for Cleomenes, after having gained very conſiderable advantages over the enemy, was at laſt entirely defeated in the battle of Scellafia, and obliged to take refuge in Ptolemy's dominions. He was received by the Egyptian monarch with the greateſt demonſtrations of kindneſs; a yearly penſion of 24 talents was aſſigned him, with a promiſe of reſtoring him to the Spartan throne; but before this could be accompliſhed, the king of Egypt died, in the 27th year of his reign, and was ſucceeded by his ſon Ptolemy Philopater.

Thus we have ſeen the Egyptian empire brought to a very great height of power; and had the ſucceeding monarchs been careful to preſerve that ſtrength of empire tranſmitted to them by Euergetes, it is very probable that Egypt might have been capable of holding the balance againſt Rome, and after the deſtruction of Carthage prevented that haughty city from becoming miſtreſs of the world. But after the death of Ptolemy Euergetes, the Egyptian empire, being governed only by weak or vicious monarchs, quickly declined, and from that time makes no conſpicuous figure in hiſtory. Ptolemy Philopater began his reign with the murder of his brother; after which, giving himſelf up to all manner of licentiouſneſs, the kingdom fell into a kind of anarchy. Cleomenes the Spartan king ſtill reſided

at court; and being now unable to bear the diſſolute manners which prevailed there, he preſſed Philopater to give him the aſſiſtance he had promiſed for reſtoring him to the throne of Sparta. This he the rather inſiſted upon, becauſe he had received advice that Antigonus king of Macedon was dead, that the Achæans were engaged in a war with the Etolians, and that the Lacedæmonians had joined the latter againſt the Achæans and Macedonians. Ptolemy, when afraid of his brother Magas, had indeed promiſed to aſſiſt the king of Sparta with a powerful fleet, hoping by this means to attach him to his own intereſt: but now when Magas was out of the way, it was determined by the king, or rather his miniſters, that Cleomenes ſhould not be aſſiſted, nor even allowed to leave the kingdom; and this extravagant reſolution produced the deſperate attempt of Cleomenes, of which an account is given in the hiſtory of SPARTA.

Of the diſorders which now enſued in the government, Antiochus king of Syria, ſurnamed the Great, took the advantage, and attempted to wreat from Ptolemy the provinces of Cælo-Syria and Paleſtine. But in this he was finally diſappointed; and might eaſily have been totally driven out of Syria, had not Ptolemy been too much taken up with his debaucheries to think of carrying on the war. The diſcontent occaſioned by this piece of negligence ſoon produced a civil war in his dominions, and the whole kingdom continued in the utmoſt confuſion till his death, which happened in the 17th year of his reign and 37th of his age.

During the reign of Philopater happened a very extraordinary event with regard to the Jews, which is mentioned in the Maccabees *. The king of Egypt, while on his Syrian expedition, had attempted to enter the temple of Jeruſalem; but being hindered by the Jews, he was filled with the utmoſt rage againſt the whole nation. On his return to Alexandria, he reſolved to make thoſe who dwelt in that city feel the firſt effects of his vengeance. He began with publiſhing a decree, which he cauſed to be engraved on a pillar erected for that purpoſe at the gate of his palace, excluding all thoſe who did not ſacrifice to the gods worſhipped by the king. By this means the Jews were debarred from ſuing to him for juſtice, or obtaining his protection when they happened to ſtand in need of it. By the favour of Alexander the Great, Ptolemy Soter and Euergetes, the Jews enjoyed at Alexandria the ſame privileges with the Macedonians. In that metropolis the inhabitants were divided into three ranks or claſſes. In the firſt were the Macedonians, or original founders of the city, and along with them were enrolled the Jews; in the ſecond were the mercenaries who had ſerved under Alexander; and in the third the native Egyptians. Ptolemy now, to be revenged of the Jews, ordered, by another decree, that they ſhould be degraded from the firſt rank, and enrolled among the native Egyptians. By the ſame decree it was enacted, that all of that nation ſhould appear at an appointed time before the proper officers, in order to be enrolled among the common people; that at the time of their inrollment they ſhould have the mark of an ivy leaf, the badge of Bacchus, impreſſed with a hot iron on their faces; that all who were thus marked ſhould be made ſlaves; and, laſtly, that if any one ſhould ſtand out againſt this decree, he ſhould immediately

Extraordi-
nary ſtory
concerning
the Jews.
* L. iii. 2.
3. 4. 5.

28
Cleomenes
king of
Sparta takes
refuge in
Egypt.

29
Ptolemy
Philopater
a cruel ty-
rant.

Egypt.

immediately put to death. That he might not, however, seem an enemy to the whole nation, he declared, that those who sacrificed to his gods should enjoy their former privileges, and remain in the same clais. Yet, notwithstanding this tempting offer, 300 only out of many thousand Jews who lived in Alexandria could be prevailed upon to abandon their religion in order to save themselves from slavery.

The apollates were immediately excommunicated by their brethren: and this their enemies construed as done in opposition to the king's order; which threw the tyrant into such a rage, that he resolved to extirpate the whole nation, beginning with the Jews who lived in Alexandria and other cities of Egypt, and proceeding from thence to Judæa and Jerusalem itself. In consequence of this cruel resolution, he commanded all the Jews that lived in any part of Egypt to be brought in chains to Alexandria, and there to be shut up in the Hippodrome, which was a very spacious place without the city, where the people used to assemble to see horse-races and other public diversions. He then sent for Herman master of the elephants; and commanded him to have 500 of these animals ready against the next day, to let loose upon the Jews in the Hippodrome. But when the elephants were prepared for the execution, and the people were assembled in great crowds to see it, they were for that day disappointed by the king's absence. For, having been late up the night before with some of his debauched companions, he did not awake till the time for the shew was over, and the spectators returned home. He therefore ordered one of his servants to call him early on the following day, that the people might not meet with a second disappointment. But when the person awaked him according to his order, the king was not yet returned to his senses; having withdrawn, exceedingly drunk, only a short time before. As he did not remember the order, he therefore fell into a violent passion, and threatened with death the servant who had awaked him; and this caused the shew to be put off till the third day. At last the king came to the Hippodrome attended with a vast multitude of spectators; but when the elephants were let loose, instead of falling upon the Jews, they turned their rage against the spectators and soldiers, and destroyed great numbers of them. At the same time, some frightful appearances which were seen in the air so terrified the king, that he commanded the Jews to be immediately set at liberty, and restored them to their former privileges. No sooner were they delivered from this danger than they demanded leave to put to death such of their nation as had abandoned their religion; and this being granted, they dispatched the apollates without excepting a single man.

33
Ptolemy
Philometor
taken pri-
soner by
Antiochus,
and Phyf-
con raised
to the
throne.

Philopater was succeeded by Ptolemy Epiphanes; and he, after a reign of 24 years, by Ptolemy Philometor. In the beginning of his reign, a war commenced with the king of Syria, who had seized on the provinces of Coele-Syria and Palestine in the preceding reign. In the course of this war, Philometor was either voluntarily delivered up to Antiochus or taken prisoner. But however this was, the Alexandrians despairing of his ever being able to recover his liberty, raised to the throne his brother Ptolemy, who took the name of *Euergetes II.* but was afterwards called *Phyfon*,

Egypt.

or "the great-bellied," on account of the prominent belly which by his gluttony and luxury he had acquired. He was scarce seated on the throne, however, when Antiochus Epiphanes, returning into Egypt, drove out Phyfon, and restored the whole kingdom, and reigns except Pelusium, to Philometor. His design was to jointly with his brother kindle a war betwixt the two brothers, so that he might have an opportunity of seizing the kingdom for himself. For this reason he kept to himself the city of Pelusium; which being the key of Egypt, he might at his pleasure re-enter the country. But Philometor, apprised of his design, invited his brother Phyfon to an accommodation; which was happily effected by their sister Cleopatra. In virtue of this agreement, the brothers were to reign jointly, and to oppose to the utmost of their power Antiochus, whom they considered as a common enemy. On this the king of Syria invaded Egypt with a mighty army, but was prevented by the Romans from conquering it.

The two brothers were no sooner freed from the apprehensions of a foreign enemy than they began to quarrel with each other. Their differences soon came to such a height, that the Roman senate interposed. But before the ambassadors employed to inquire into the merits of the cause could arrive in Egypt, Phyfon had driven Philometor from the throne, and obliged him to quit the kingdom. On this the dethroned prince fled to Rome, where he appeared meanly dressed, and without attendants. He was very kindly received by the senate; who were so well satisfied of the injustice done him, that they immediately decreed his restoration. He was reconducted accordingly; and, on the arrival of the ambassadors in Egypt, an accommodation between the two brothers was negotiated. By this agreement, Phyfon was put in possession of Libya and Cyrene, and Philometor of all Egypt and the island of Cyprus; each of them being declared independent of the other in the dominion allotted to them. The treaty, as usual, was confirmed with oaths and sacrifices, and was broken almost as soon as made. Phyfon was dissatisfied with his share of the dominions; and therefore sent ambassadors to Rome, desiring that the island of Cyprus might be added to his possessions. This could not be obtained by the ambassadors; and therefore Phyfon went to Rome in person. His demand was evidently unjust; but the Romans, considering that it was their interest to weaken the power of Egypt as much as possible, without further ceremony, adjudged the island to him.

Phyfon set out from Rome with two ambassadors; and arriving in Greece on his way to Cyprus, he raised there a great number of mercenaries, with a design to sail immediately to that island and conquer it. But the Roman ambassadors telling him, that they were commanded to put him in possession of it by fair means and not by force, he dismissed his army, and returned to Libya, while one of the ambassadors proceeded to Alexandria. Their design was to bring the two brothers to an interview on the frontiers of their dominions, and there to settle matters in an amicable manner. But the ambassador who went to Alexandria, found Philometor very averse from compliance with the decree of the senate. He put off the ambassador so long, that Phyfon sent the other also to Alexandria, hoping that the joint persuasions of the two would in-
duce

duce

Egypt.

35
Philometor
refuses to
comply.

duce Philometor to comply. But the king, after entertaining them at an immense charge for 40 days, at last plainly refused to submit, and told the ambassadors that he was resolved to adhere to the first treaty. With this answer the Roman ambassadors departed, and were followed by others from the two brothers. The senate, however, not only confirmed their decree in favour of Physcon, but renounced their alliance with Philometor, and commanded his ambassador to leave the city in five days.

36
Rebellion
against
Physcon.

In the mean time, the inhabitants of Cyrene having heard unfavourable accounts of Physcon's behaviour during the short time he reigned in Alexandria, conceived to strong an aversion against him, that they resolved to keep him out of their country by force of arms. On receiving intelligence of this resolution, Physcon dropped all thoughts of Cyprus for the present; and halted with all his forces to Cyrene, where he soon got the better of his rebellious subjects, and established himself in the kingdom. His vicious and tyrannical conduct, however, soon estranged from him the minds of his subjects, in such a manner, that some of them entering into a conspiracy against him, fell upon him one night as he was returning to his palace, wounded him in several places, and left him for dead on the spot. This he laid to the charge of his brother Philometor; and as soon as he was recovered, took another voyage to Rome. Here he made his complaints to the senate, and showed them the scars of his wounds, accusing his brother of having employed the assassins from whom he received them. Though Philometor was known to be a man of a most humane and mild disposition, and therefore very unlikely to have been concerned in so black an attempt; yet the senate, being offended at his refusing to submit to their decree concerning the island of Cyprus, hearkened to this false accusation; and carried their prejudice so far, that they not only refused to hear what his ambassadors had to say, but ordered them immediately to depart from the city. At the same time, they appointed five commissioners to conduct Physcon into Cyprus, and put him in possession of that island, enjoining all their allies in those parts to supply him with forces for that purpose.

37
He is de-
fected and
taken pri-
soner by
Philome-
tor.

Physcon having by this means got together an army which seemed to him to be sufficient for the accomplishment of his design, landed in Cyprus; but being there encountered by Philometor in person, he was entirely defeated, and obliged to shelter himself in a city called *Lapitho*. Here he was closely besieged, and at last obliged to surrender. Every one now expected that Physcon would have been treated as he deserved; but his brother, instead of punishing, restored him to the government of Libya and Cyrene, adding some other territories instead of the island of Cyprus, and promising him his daughter in marriage. Thus an end was put to the war between the two brothers; for the Romans were alarmed any longer to oppose a prince who had given such a signal instance of his justice and clemency.

On his return to Alexandria, Philometor appointed one Archias governor of Cyprus. But he, soon after the king's departure, agreed with Demetrius king of Syria, to betray the island to him for 500 talents. The treachery was discovered before it took effect; and the traitor, to avoid the punishment due to his crime,

N° 110.

laid violent hands on himself. Ptolemy being offended with Demetrius for this attempt on Cyprus, joined Attalus king of Pergamus, and Ariarathes king of Cappadocia, in setting up a pretender to the crown of Syria. This was Alexander Balas; to whom he even gave his daughter Cleopatra in marriage, after he had placed him on the throne of Syria. But he, notwithstanding these and many other favours, being suspected of having entered into a plot against his benefactor, Ptolemy became his greatest enemy; and marching against him, routed his army in the neighbourhood of Antioch. He did not, however, long enjoy his victory; for he died in a few days after the engagement, of the wounds he had received.

Egypt.

38
Death of
Philome-
tor.

On the death of Philometor, Cleopatra the queen designed to secure the throne for her son. But some of the principal nobility declaring for Physcon, a civil war was about to ensue, when matters were compromised on condition that Physcon should marry Cleopatra, that he should reign jointly with her during his life, and declare her son by Philometor heir to the crown. These terms were no sooner agreed upon than Physcon married Cleopatra, and, on the very day the nuptials, murdered her son in her arms.—This was only a prelude to the cruelties which he afterwards practised on his subjects. He was no sooner seated on the throne, than he put to death all those who had shown any concern for the murder of the young prince. He then wrecked his fury on the Jews, whom he treated more like slaves than subjects, on account of their having favoured the cause of Cleopatra. His own people were treated with little more ceremony. Numbers of them were every day put to death for the smallest faults, and often for no fault at all, but merely to gratify his unhuman temper. His cruelty towards the Alexandrians is particularly mentioned under the article *ALEXANDRIA*.—In a short time, being wearied of his queen, who was also his sister, he divorced her; and married her daughter, who was also called *Cleopatra*, and whom he had previously ravished. In short, his behaviour was so exceedingly wicked, that it soon became quite intolerable to his subjects; and he was obliged to fly to the island of Cyprus with his new queen, and *Memphis*, a son he had by her mother.

39
Monstrous
wickedness
of Physcon.

40
He is driven
out.

On the flight of the king, the divorced queen was placed on the throne by the Alexandrians; but Physcon, fearing lest a son whom he had left behind should be appointed king, sent for him into Cyprus, and caused him to be assassinated as soon as he landed. This provoked the people against him to such a degree, that they pulled down and dashed to pieces all the statues which had been erected to him in Alexandria. This the tyrant supposed to have been done at the instigation of the queen, and therefore resolved to revenge it on her by killing his own son whom he had by her. He therefore, without the least remorse, caused the young prince's throat to be cut; and having put his mangled limbs into a box, sent them as a present to his mother Cleopatra. The messenger with whom this box was sent, was one of his guards. He was ordered to wait till the queen's birth-day, which approached, and was to be celebrated with extraordinary pomp; and in the midst of the general rejoicing, he was to deliver the present.

41
Murders
his son.

The horror and detestation occasioned by this unexampled piece of cruelty cannot be expressed. An army

army was soon raised, and the command of it given to one *Mariyas*, whom the queen had appointed general, and enjoined to take all the necessary steps for the defence of the country. On the other hand, *Physcon*, having hired a numerous body of mercenaries, sent them, under the command of one *Hegelochus*, against the Egyptians. The two armies met on the frontiers of Egypt, on which a bloody battle ensued; but at last the Egyptians were entirely defeated, and *Mariyas* was taken prisoner. Every one expected that the captive general would have been put to death with the severest torments; but *Physcon*, perceiving that his cruelties only exasperated the people, resolved to try whether he could regain their affections by lenity; and therefore pardoned *Mariyas*, and set him at liberty.—*Cleopatra*, in the mean time, being greatly distressed by this overthrow, demanded assistance from *Demetrius* king of Syria, who had married her eldest daughter by *Philometor*, promising him the crown of Egypt for his reward. *Demetrius* accepted the proposal without hesitation, marched with all his forces into Egypt, and there laid siege to *Pelusium*. But he being no less hated in Syria than *Physcon* was in Egypt, the people of *Antioch*, taking advantage of his absence, revolted against him, and were joined by most of the other cities in Syria. Thus *Demetrius* was obliged to return; and *Cleopatra*, being now in no condition to oppose *Physcon*, fled to *Ptolemais*, where her daughter the queen of Syria at that time resided. *Physcon* was then restored to the throne of Egypt, which he enjoyed without further molestation till his death; which happened at *Alexandria*, in the 29th year of his reign, and 67th of his age.

To *Physcon* succeeded *Ptolemy Lathyrus*, about 122 years before Christ; but he had not reigned long, before his mother, finding that he would not be entirely governed by her, by false surmises stirred up the Alexandrians, who drove him from the throne, and placed on it his youngest brother *Alexander*. *Lathyrus* after this was obliged to content himself with the government of Cyprus, which he was permitted to enjoy in quiet. *Ptolemy Alexander*, in the mean time, finding he was to have only the shadow of sovereignty, and that his mother *Cleopatra* was to have all the power, stole away privately from *Alexandria*. The queen used every artifice to bring him back, as well knowing that the Alexandrians would never suffer her to reign alone. At last her son yielded to her intreaties; but soon after, understanding that she had hired assassins to dispatch him, he caused her to be murdered.

The death of the queen was no sooner known to the Alexandrians, than, disdaining to be commanded by a paricide, they drove out *Alexander*, and recalled *Lathyrus*.—The deposed prince for some time led a rambling life in the island of *Cos*; but having got together some ships, he, the next year, attempted to return into Egypt. But being met by *Tyrchus*, *Lathyrus's* admiral, he was defeated, and obliged to fly to *Myra* in *Lycia*. From *Myra* he steered his course towards Cyprus, hoping that the inhabitants would place him on the throne, instead of his brother. But *Chareas*, another of *Lathyrus's* admirals, coming up with him while he was ready to land, an engagement ensued, in which *Alexander's* fleet was dispersed, and he himself killed.

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During these disturbances, *Apion* king of *Cyrenaiaca*, the son of *Ptolemy Physcon* by a concubine, having maintained peace and tranquillity in his dominions during a reign of 21 years, died, and by his will left his kingdom to the Romans: and thus the Egyptian empire was considerably reduced and circumscribed.

Lathyrus being now delivered from all competitors, turned his arms against the city of *Thebes*, which had revolted from him. The king marched in person against the rebels; and, having defeated them in a pitched battle, laid close siege to their city. The inhabitants defended themselves with great resolution for three years. At last, however, they were obliged to submit, and the city was given up to be plundered by the soldiery. They left every where the most melancholy monuments of their avarice and cruelty; so that *Thebes*, which till that time had been one of the most wealthy cities of Egypt, was now reduced so low that it never afterwards made any figure.

About 76 years before Christ, *Ptolemy Lathyrus Alexander* was succeeded by *Alexander II.* He was the son of the *Ptolemy Alexander* for whom *Lathyrus* had been driven out; and had met with many adventures. He was first sent by *Cleopatra* into the island of *Cos*, with a great sum of money, and all her jewels; as thinking that was the safest place where they could be kept. When *Mithridates* king of *Pontus* made himself master of that island, the inhabitants delivered up to him the young Egyptian prince, together with all the treasures. *Mithridates* gave him an education suitable to his birth; but he, not thinking himself safe with a prince who had shed the blood of his own children, fled to the camp of *Sylla* the Roman dictator, who was then making war in Asia. From that time he lived in the family of the Roman general, till news was brought to Rome of the death of *Lathyrus*. *Sylla* then sent him to Egypt to take possession of the throne. But, before his arrival, the Alexandrians had chosen *Cleopatra* for their sovereign. To compromise matters, however, it was agreed, that *Ptolemy* should marry her, and take her for his partner in the throne. *Ptolemy* was accordingly done; and 19 days after the marriage, the unhappy queen was murdered by her husband, who for 15 years afterwards showed himself such a monster of wickedness, that a general insurrection at last ensued among his subjects, and he was obliged to fly to *Pompey* the Great, who was then carrying on the war against *Mithridates* king of *Pontus*. But *Pompey* refusing to concern himself in the matter, he retired to the city of *Tyre*, where he died some months after.

When he was forced to shut himself up in the city of *Tyre*, *Alexander* had sent ambassadors to Rome, in order to influence the senate in his favour. But, before the negotiation was finished, he made over kingdom to his last will all his rights to the Roman people, declaring them heirs to his kingdom: not out of any affection to the republic; but with a view to raise disputes between the Romans and his rival *Auletes*, whom the Egyptians had placed on the throne. The will was brought to Rome, where it occasioned warm debates. Some were for taking immediate possession of the kingdom. Others thought that no notice should be taken of such a will, because *Alexander* had no right to dispose of his dominions in prejudice of his successor, and to exclude from the crown those who were

45
Cyrenaiaca
bequeathed to
the Romans.

46
City of
Thebes
ruined.

47
He succeeded
his father
Lathyrus.

48
Marries
Cleopatra,
and murders
her.

49
Leaves his
kingdom to
the Romans.

Egypt.

of the royal blood of Egypt. Cicero represented, that such a notorious imposition would debase the majesty of the Roman people, and involve them in endless wars and disputes; that the fruitful fields of Egypt would be a strong temptation to the avarice of the people, who would insist on their being divided among them; and lastly, that by this means the bloody quarrels about the Agrarian laws would be revived. These reasons had some weight with the senate; but what chiefly prevented them from seizing on Egypt at this time was, that they had lately taken possession of the kingdom of Bithynia in virtue of the will of Nicomedes, and of Cyrene and Libya by the will of Apion. They thought, therefore, that if they should, on the like pretence, take possession of the kingdom of Egypt, this might too much expose their design of setting up a kind of universal monarchy, and occasion a formidable combination against them.

50
Character
of Auletes
the new
king.

Auletes, who was now raised to the throne by the Egyptians, is said to have surpassed all the kings that went before him in the effeminacy of his manners. The name *Auletes*, which signifies the *flute player*, was given him because he piqued himself on his skill in performing upon that instrument, and was not ashamed even to contend for the prize in the public games. He took great pleasure in imitating the manners of the Bacchanals; dancing in a female dress, and in the same measures that they used during the solemnity of their god Bacchus; and hence he had the surname of the *New Dionysius* or *Bacchus*. As his title to the crown was disputable (he being only the son of a concubine), the first care of Auletes was to get himself acknowledged by the Romans, and declared their ally. This was obtained by applying to Julius Cæsar, who was at that time consul, and immensely in debt. Cæsar being glad of such an opportunity of raising money, made the king of Egypt pay pretty dear for his alliance. Six thousand talents, a sum equal to L. 1,162,500 Sterling, were paid partly to Cæsar himself, and partly to Pompey, whose interest was necessary for obtaining the consent of the people. Though the revenues of Egypt amounted to twice this sum, yet Auletes found it impossible for him to raise it without severely taxing his subjects. This occasioned a general discontent; and while the people were almost ready to take up arms, a most unjust decree passed at Rome for seizing the island of Cyprus. When the Alexandrians heard of the intentions of the republic, they pressed Auletes to demand that island as an ancient appendage of Egypt; and, in case of a refusal, to declare war against that haughty and imperious people, who, they now saw, though too late, aimed at nothing less than the sovereignty of the world. With this request the king refused to comply; upon which his subjects, already provoked beyond measure at the taxes with which they were loaded, flew to arms, and surrounded the palace. The king had the good luck to escape their fury, and immediately leaving Alexandria, set sail for Rome.

52
Is driven
from the
throne, and
flies to
Rome.

In his way to that city, he landed on the island of Rhodes, where the famous Cato at that time was, being on his way to Cyprus, to put the unjust decree of the senate in execution. Auletes, desirous to confer with a man of his prudence, immediately sent to acquaint him with his arrival. He imagined, that, up-

on this notice, Cato would immediately come and wait upon him; but the proud Roman told the messenger, that if the king of Egypt had any thing to say to Cato, he might, if he thought proper, come to his house. Accordingly the king went to pay him a visit; but was received with very little ceremony by Cato, who did not even vouchsafe to rise out of his seat when he came into his presence. When Auletes had laid his affairs before this haughty republican, he was blamed by him for leaving Egypt, the richest kingdom in the world, in order to expose himself, as he said, to the indignities he would meet with at Rome. There Cato told him, that nothing was in request but wealth and grandeur. All the riches of Egypt, he said, would not be sufficient to satisfy the avarice of the leading men in Rome. He therefore advised him to return to Egypt; and strive, by a more equitable conduct, to regain the affections of his people. He even offered to reconduct him thither, and employ his good offices in his behalf. But though Ptolemy was sensible of the propriety of this advice, the friends he had with him dissuaded him from following it, and accordingly he set out for Rome.

On his arrival in this metropolis, the king found, to his great concern, that Cæsar, in whom he placed his greatest confidence, was then in Gaul. He was received, however, by Pompey with great kindness. He assigned him an apartment in his own house, and omitted nothing that lay in his power to serve him. But, notwithstanding the protection of so powerful a man, Auletes was forced to go from house to house like a private person, soliciting the votes of the senators. After he had spent immense treasures in procuring a strong party in the city, he was at last permitted to lay his complaints before the senate; and at the same time there arrived an embassy from the Alexandrians, consisting of 100 citizens, to acquaint the senate with the reasons of their revolt.

When Auletes first set out for Rome, the Alexandrians, not knowing what was become of him, placed on the throne his daughter Berenice; and sent an embassy into Syria to Antiochus Asiaticus, inviting him into Egypt to marry the queen, and reign in partnership with her. Antiochus was dead before the arrival of the ambassadors; upon which the same proposal was made to his brother Seleucus, who readily accepted it. This Seleucus is described by Strabo as monstrously deformed in body, and still more so in mind. The Egyptians nicknamed him *Cynibastres*, or *the Scullion*; a name which seemed more fit for him than any other. He was scarce settled on the throne, when he gave a signal instance of his sordid and avaricious temper. Ptolemy the first had caused the body of Alexander the Great to be deposited in a coffin of massy gold. This the king seized upon; and by that means provoked his wife Berenice to such a degree, that she caused him to be murdered. She then married one Archelaus, high priest of Comana in Pontus, who pretended to be the son of Mithridates the Great; but was, in fact, only the son of that monarch's general.

Auletes was not a little alarmed on hearing of these transactions, especially when the ambassadors arrived, who he feared would overturn all the schemes he had laboured so much to bring about. The embassy was headed by one Dion, a celebrated academic philosopher,

Egypt.

53
Cato's ad-
vice to him

54
Infamous
conduct of
Auletes.

55
Berenice
raised to the
throne of
Egypt.

56
She marries
Seleucus, and
murders him.

57
Marries
Archelaus;

-who

⁵⁸ ^{Egypt.} who had many powerful friends at Rome. But Ptolemy found means to get both him and most of his followers assassinated; and this intimidated the rest to such a degree, that they durst not execute their commission, or, for some time, even demand justice for the murder of their colleagues.

The report of so many murders, however, at last spread a general alarm. Auletes, sure of the protection of Pompey, did not scruple to own himself the perpetrator of them. Nay, though an action was commenced against one Alcibiades an assassin who had stabbed Dion the chief of the embassy above mentioned, and the crime was fully proved; yet he was acquitted by the venal judges, who had all been bribed by Ptolemy. In a short time, the senate passed a decree, by which it was enacted, that the king of Egypt should be restored by force of arms. All the great men in Rome were ambitious of this commission; which, they well knew, would be attended with immense profit. Their contests on this occasion took up a considerable time; and at last a prophecy of the Sybil was found out, which forbade the assisting an Egyptian monarch with an army. Ptolemy, therefore, wearied out with so long a delay, retired from Rome, where he had made himself generally odious, to the temple of Diana at Ephesus, there to wait the decision of his fate. Here he remained a considerable time: but as he saw that the senate came to no resolution, tho' he had solicited them by letters to do so; at last, by Pompey's advice, he applied to Gabinius the proconsul of Syria. This Gabinius was a man of a most infamous character, and ready to undertake any thing for money. Therefore, though it was contrary to an express law for any governor to go out of his province without positive orders from the senate and people of Rome, yet Gabinius ventured to transgress this law, upon condition of being well paid for his pains. As a recompence for his trouble, however, he demanded 10,000 talents; that is, L. 1,037,500 Sterling. Ptolemy, glad to be restored on any terms, agreed to pay the above mentioned sum; but Gabinius would not stir till he had received one-half of it. This obliged the king to borrow it from a Roman knight named *Caius Rabirius Posthumus*; Pompey interpoling his credit and authority for the payment of the capital and interest.

⁶⁰ Gabinius undertakes to restore him for a great sum, Archelaus was utterly defeated and killed.

Gabinius now set out for Egypt, attended by the famous Mark Anthony, who at this time served in the army under him. He was met by Archelaus, who since the departure of Auletes had reigned in Egypt jointly with Berenice, at the head of a numerous army. The Egyptians were utterly defeated, and Archelaus taken prisoner in the first engagement. Thus Gabinius might have put an end to the war at once: but his avarice prompted him to dismiss Archelaus on his paying a considerable ransom; after which, pretending that he had made his escape, fresh wars were demanded from Ptolemy for defraying the expences of the war. For these sums Ptolemy was again obliged to apply to Rabirius, who lent him what money he wanted at a very high interest. At last, however, Archelaus was defeated and killed, and thus Ptolemy again became master of all Egypt.

No sooner was Auletes firmly settled on the throne, than he put to death his daughter Berenice, and oppressed his people with the most cruel exactions, in or-

der to procure the money he had been obliged to borrow while in a state of exile. These oppressions and exactions the cowardly Egyptians bore with great patience, being intimidated by the garrison which Gabinius had left in Alexandria. But neither the fear of death, and the Romans, nor the authority of Ptolemy, could make them put up an affront offered to their religion. A Roman soldier happened to kill a cat, which was an animal held sacred and even worshipped by the Egyptians; and no sooner was this supposed sacrilege known, than the Alexandrians made a general insurrection, and, gathering together in crowds, made their way through the Roman guards, dragged the soldier out of his house, and, in spite of all opposition, tore him in pieces.

Notwithstanding the heavy taxes, however, which Ptolemy laid on his people, it doth not appear that he had any design of paying his debts. Rabirius, who, as we have already observed, had lent him immense sums, finding that the king effected delays, took him in voyage to Egypt, in order to expropriate with him in person. Ptolemy paid very little regard to his expostulations; but excused himself on account of the bad state of his finances. For this reason he offered to make Rabirius collector-general of his revenues, that he might in that employment pay himself. The unfortunate creditor accepted the employment for fear of losing his debt. But Ptolemy, soon after, upon some frivolous pretence or other, caused him and all his servants to be closely confined. This base conduct exasperated Pompey as much as Rabirius; for the former had been in a manner security for the debt, as the money had been lent at his request, and the business transacted at a country house of his near Alba. However, as Rabirius had reason to fear the world, he took the first opportunity of making his escape, glad to get off with life from his cruel and faithless debtor. To complete his misfortunes, he was prosecuted at Rome as soon as he returned, 1. For having enabled Ptolemy to corrupt the senate with sums lent him for that purpose. 2. For having defaced and dishonoured the character of a Roman knight, by farming the revenues, and becoming the servant of a foreign prince. 3. For having been an accomplice with Gabinius, and sharing with him the 10,000 talents which that proconsul had received for his Egyptian expedition. By the eloquence of Cicero he was acquitted; and one of the best orations to be found in the writings of that author was composed on this occasion. Gabinius was also prosecuted; and, as Cicero spoke against him, he very narrowly escaped death. He was, however, condemned to perpetual banishment, after having been stripped of all he was worth. He lived in exile till the time of the civil wars, when he was recalled by Caesar, in whose service he lost his life.

Auletes enjoyed the throne of Egypt about four years after his re-establishment; and at his death left children to his children, a son and two daughters, under the tuition of the Roman people. The name of the son was Ptolemy, those of the daughters were *Cleopatra* and *Arsinoe*. This was the Cleopatra who afterwards became so famous, and had so great a share in the civil wars of Rome. As the transactions of the present reign, however, are so closely connected with the affairs of Rome, that they cannot be well understood without

Egypt.

without knowing the situation of the Romans at that time, we refer for an account of them to the *History of Rome*.

65

State of Egypt till its conquest by the Khalif of Cairwan.

With Cleopatra ended the family of Ptolemy Lagus, the founder of the Grecian empire in Egypt, after it had held that country in subjection for the space of 294 years. From this time Egypt became a province of the Roman empire, and continued subject to the emperors of Rome or Constantinople. In the year 642, it was conquered by the Arabs under Amru Ebn Al As, one of the generals of the Khalif Omar. In the year 889, an independent government was set up in this kingdom by Ahmed Ebn Tolun, who rebelled against Al Mokhadi Khalif of Bagdad. It continued to be governed by him and his successors for 27 years, when it was again reduced by Al Moctali Khalif of Bagdad. In about 30 years after, we find it again an independent state, being joined with Syria under Mahomet Ebn Taj, who had been appointed governor of these provinces. This government, however, was also but short-lived; for in the year 968 it was conquered by Jawhar, one of the generals of Moez Ledinillah, the Fatemite Khalif of Cairwan in Barbary. See BARBARY, n° 34.

66

Moez takes possession of his new kingdom.

No sooner was Moez informed of the success of his general, than he prepared with all expedition to go and take possession of his new conquest. Accordingly he ordered all the vast quantities of gold which he and his predecessors had amassed, to be cast into ingots of the size and figure of the mill-stones used in hand-mills, and conveyed on camels backs into Egypt. To show that he was fully determined to abandon his dominions in Barbary, and to make Egypt the residence of himself and his successors, he caused the remains of the three former princes of his race to be removed from Cairwan in Barbary, and to be deposited in a stately mosque erected for that purpose in the city of Cairo in Egypt. This was a most effectual method to induce his successors to reside in Egypt also, as it was become an established custom and duty among those princes frequently to pay their respectful visits to the tombs of their ancestors.

67

Will not suffer prayers to be said for the Khalif of Bagdad.

To establish himself the more effectually in his new dominions, Moez suppressed the usual prayers made in the mosques for the Khalifs of Bagdad, and substituted his own name in their stead. This was complied with, not only in Egypt and Syria, but even throughout all Arabia, the city of Mecca alone excepted. The consequence was, a schism in the Mahomedan faith, which continued upwards of 200 years, and was attended with continual anathemas, and sometimes destructive wars between the Khalifs of Bagdad and of Egypt.—Having fully established himself in his kingdom, he died in the 45th year of his age, three years after he had left his dominions in Barbary; and was succeeded by his son Abu Al Manfur Barar, surnamed Aziz Billah.

The new Khalif succeeded to the throne at the age of 21; and committed the management of affairs entirely to the care of Jawhar, his father's long experienced general and prime minister. In 978, he sent this famous warrior to drive out Al Aftekin, the Emir of Damascus. The Egyptian general accordingly formed the siege of that place; but at the end of two months, was obliged to raise it, on the approach of an

army of Karmatians under the command of Al Hakem. As Jawhar was not strong enough to venture an engagement with these Karmatians, it was impossible for him to hinder them from effecting a junction with the forces of Al Aftekin. He therefore retreated, or rather fled, towards Egypt with the utmost expedition; but being overtaken by the two confederate armies, he was soon reduced to the last extremity. He was, however, permitted to resume his march, on condition that he passed under Al Aftekin's sword and Al Hakem's lance; and to this disgraceful condition Jawhar found himself obliged to submit. On his arrival in Egypt, he immediately advised Al Aziz to undertake an expedition in person into the east, against the combined army of Turks, Karmatians, and Damascenes, under the command of Al Aftekin and Al Hakem. The Khalif followed his advice; and advancing against his enemies, overthrew them with great slaughter. Al Aftekin himself escaped out of the battle; but was afterwards taken and brought to Al Aziz, who made him his chamberlain, and treated him with great kindness. Jawhar, in the mean time, was disgraced on account of his bad success; and in this disgrace he continued till his death, which happened in the year of our Lord 990, and of the Hegira 381.

This year Al Aziz having received advice of the death of Saado'dawla prince of Aleppo, sent a formidable army under the command of a general named *Manjubekin*, to reduce that place. Lulu, who had been appointed guardian to Saado'dawla's son, finding himself pressed by the Egyptians, who carried on the siege with great vigour, demanded assistance from the Greek emperor. Accordingly, he ordered a body of troops to advance to Lulu's relief. Manjubekin, being informed of their approach, immediately raised the siege, and advanced to give them battle. An obstinate engagement ensued, in which the Greeks were at last overthrown with great slaughter. After this victory, Manjubekin pushed on the siege of Aleppo very briskly; but finding the place capable of defending itself much longer than he at first imagined, and his provisions beginning to fail, he raised the siege. The Khalif upon this sent him a very threatening letter, and commanded him to return before Aleppo. He did so; and continued the siege for 13 months; during all which time it was defended by Lulu with incredible bravery. At last, the Egyptians hearing that a numerous army of Greeks was on their way to relieve the city, they raised the siege, and fled with the utmost precipitation. The Greeks then took and plundered some of the cities which Al Aziz possessed in Syria; and Manjubekin made the best of his way to Damascus, where he set up for himself. Al Aziz being informed of this revolt, marched in person against him with a considerable army; but being taken ill by the way, he expired, in the 21st year of his reign and 42d of his age.

Al Aziz was succeeded by his son Abu Al Manfur, surnamed Al Hakem; who, being only 11 years of age, was put under the tuition of an eunuch of approved integrity.

This reign is remarkable for nothing so much as the madness with which the Khalif was seized in the latter months of part of it. This manifested itself first by his issuing the Khalif many preposterous edicts; but at length grew to such

Egypt.

69

Aleppo besieged without success.

68

Unsuccessful expedition into Syria.

70

Strange madness of the Khalif Al Hakem.

Egypt.

a height, that he fancied himself a god, and found no fewer than 16,000 persons who owned him as such. These were mostly the Dararians, a new sect sprung up about this time, who were so called from their chief, Mohammed Ebn Ishmael, surnamed Darari. He is supposed to have inspired the mad khalif with this impious notion; and, as Darari set up for a second Moses, he did not scruple to assert that Al Hakem was the great Creator of the universe. For this reason, a zealous Turk stabbed him in the khalif's chariot. His death was followed by a three days uproar in the city of Cairo; during which, Darari's house was pulled down, and many of his followers massacred. The sect, however, did not expire with its author. He left behind him a disciple named Hamza, who, being encouraged by the mad khalif, spread it far and wide through his dominions. This was quickly followed by an abrogation of all the Mahomedan fasts, festivals, and pilgrimages, the grand one to Mecca in particular; so that the zealous Mahometans were now greatly alarmed, as justly supposing that Al Hakem designed entirely to suppress the worship of the true God, and introduce his own in its place. From this apprehension, however, they were delivered by the death of the khalif; who was assassinated, by a contrivance of his own sister, in the year 1020.

Al Hakem was succeeded by his son Al Thaher, who reigned 15 years; and left the throne to a son under seven years of age, named Al Mostanser Billah.— In the year 1041, a revolt happened in Syria; but Al Mostanser having sent a powerful army into that country, under the command of one *Aushtekin*, he not only reduced the rebels, but considerably enlarged the Egyptian dominions in Syria.

71 Al Mostanser attempted the conquest of Bagdad.

72 Khalif of Bagdad assisted by Togrol Beg.

73 Bagdad taken.

up in a bull's hide, with the horns placed over his head, and hung upon hooks, he was beaten without ceasing till he died. The imperial palace was plundered, and the khalif himself detained a close prisoner.

This success was but short-lived; for, in 1059, Togrol Beg defeated his brother Ibrahim, took him prisoner, and strangled him with a bow-string. He then marched to Bagdad, which Bassafiri thought proper to abandon at his approach. Here the khalif Al Kayem was delivered up by Mahras, the governor of a city called *Haduba*, who had the charge of him. The khalif was immediately restored to his dignity; which Bassafiri no sooner understood, than he again advanced towards the city. Against him Togrol Beg sent a part of his army under some of his generals, while he himself followed with the rest. A battle ensued, in which the army of Bassafiri was defeated, and he himself killed. His head was brought to Togrol Beg, who caused it to be carried on a pike through the streets of Bagdad.

75 Decline of the Egyptian empire.

76 Terrible famine.

This disaster was soon followed by others still more terrible. In 1066, a famine raged over all Egypt and Syria, with such fury, that dogs and cats were sold for four or five Egyptian dinars each, and other provisions in proportion. Multitudes of people died in Cairo for want of food. Nay, so great was the scarcity, that the vizir had but one servant left who was able to attend him to the khalif's palace, and to whom he gave the care of his horse when he alighted at the gate. But, at his return, he was surprised to find that the horse had been carried off, killed, and eaten by the famished people. Of this he complained to the khalif; who caused three of them who had carried off the horse to be hanged. Next day, however, he was still more surprised to hear, that all the flesh had been picked off the bones of the three unhappy criminals, so that nothing but the skeletons were left. And to such a degree of misery were the inhabitants, not only in Cairo but through all Egypt, reduced, that the carcases of those who died were sold for food at a great price, instead of being buried. All this time the khalif showed the greatest kindness and beneficence towards his unhappy subjects, inasmuch that of 10,000 horses, mules, and camels, which he had in his stables when the famine began, he had only three left when it was removed.

77 Invaded by the Turks.

Naferod'awla, the very general who had been sent against

Egypt

gainst the rebel Azzodawla and defeated by him. He began with besieging the khalf in his own palace; and the unhappy prince, being in no condition to make resistance, was obliged to buy himself off at the expence of every thing valuable that was left in his ex-hausted capital and treasury. This, however, did not hinder these merciless plunderers from ravaging all the Lower Egypt from Cairo to Alexandria, and committing the most horrid cruelties through that whole tract.—This happened in the years 1067 and 1068; and in 1069 and 1070, there happened two other revolts in Syria: so that this country was now almost entirely lost.

78
Jerusalem
taken.

In 1095 died the khalf Al Mostanser, having reigned 60 years; and was succeeded by his son Abul Kasem, furnished Al Mostali.—The most remarkable transaction of this prince's reign, was his taking the city of Jerusalem from the Turks in 1098: but this success was only of short duration; for it was, the same year, taken by the crusaders.

79
A revolution
in the
kingdom.

From this time to the year 1164, the Egyptian history affords little else than an account of the intestine broils and contests between the vizirs or prime ministers, who were now become so powerful, that they had in a great measure stripped the khalfs of their civil power, and left them nothing but a shadow of spiritual dignity. These contests at last gave occasion to a revolution, by which the race of Fatemite khalfs was totally extinguished. This revolution was accomplished in the following manner.—One *Shawer*, having overcome all his competitors, became vizir to Al Aded, the eleventh khalf of Egypt. He had not been long in possession of this office, when Al Dargam, an officer of rank, endeavoured to deprive him of it. Both parties quickly had recourse to arms; and a battle ensued, in which Shawer was defeated, and obliged to fly to Nuroddin prince of Syria, by whom he was graciously received, and who promised to reinstate him in his office of vizir. As an inducement to Nuroddin to assist him more powerfully, Shawer told him that the crusaders had landed in Egypt, and made a considerable progress in the conquest of it. He promised also, that, in case he was reinstated in his office, he would pay Nuroddin annually the third part of the revenues of Egypt; and would, besides, defray the whole expence of the expedition.

As Nuroddin bore an implacable hatred to the Christians, he readily undertook an expedition against them, for which he was to be so well paid. He therefore sent an army into Egypt under the command of Shawer and a general named *Afadoddin*. Dargam, in the mean time, had cut off so many generals whom he imagined favourable to Shawer's interest, that he thereby weakened the military force of the kingdom, and in a great measure deprived himself of the power of resistance. He was therefore easily overthrown by Afadoddin, and Shawer reinstated in the office of vizir. The faithless minister, however, no sooner saw himself firmly established in his office, than he refused to fulfil his engagements to Nuroddin by paying the stipulated sums. Upon this, Afadoddin seized Pelusium and some other cities. Shawer then entered into an alliance with the crusaders, and Afadoddin was besieged by their combined forces in Pelusium. Nuroddin, however, having invaded the Christian dominions in Syria, and taken a

Egypt

strong fortrefs called *Harem*, Shawer and his confederates thought proper to hearken to some terms of accommodation, and Afadoddin was permitted to depart for Syria.

In the mean time, Nuroddin, having subdued the greatest part of Syria and Mesopotamia, resolved to make Shawer feel the weight of his resentment, on account of his perfidious conduct. He therefore sent back Afadoddin into Egypt with a sufficient force, to compel Shawer to fulfil his engagements: but this the vizir took care to do before the arrival of Afadoddin; and thus, for the present, avoided the danger. It was not long, however, before he gave Nuroddin fresh occasion to send this general against him. That prince had now driven the crusaders almost entirely out of Syria, but was greatly alarmed at their progress in Egypt; and consequently offended at the alliance which Shawer had concluded with them, and which he still persisted in observing. This treaty was also thought to be contrived on purpose to prevent Shawer from being able to fulfil his promise to Nuroddin, of sending him annually a third of the revenues of Egypt. Nuroddin therefore again dispatched Afadoddin into Egypt, in the year 1166, with a sufficient force, and attended by the famous Salahaddin, or Saladin, his own nephew. They entered the kingdom without opposition, and totally defeated Shawer and the crusaders. They next made themselves masters of Alexandria; and, after that, over-ran all the Upper Egypt. Saladin was left with a considerable garrison in Alexandria; but Afadoddin was no sooner gone, than the crusaders laid siege to that city. This at last obliged Afadoddin to return to its relief. The great losses he had sustained in this expedition probably occasioned his agreeing to a treaty with Shawer, by which he engaged to retire out of Egypt, upon being paid a sum of money.

Afadoddin was no sooner gone, than Shawer entered into a fresh treaty with the Franks. By this new alliance he was to attack Nuroddin in his own dominions, as he was at that time engaged in quelling some revolters, which would effectually prevent his sending any more forces into Egypt. This treaty so provoked the Syrian prince, that he resolved to suspend his other conquests for some time, and exert his whole strength in the conquest of Egypt.

By this time the crusaders had reduced Pelusium, and made a considerable progress in the kingdom, as well as in some other countries, through the divisions which reigned among the Mahometan princes. In such places as they conquered, they put almost every body to the sword, Christians as well as Mahometans; selling their prisoners for slaves, and giving up the towns to be plundered by the foldiers. From Pelusium they marched to Cairo; which was then in no posture of defence, and in the utmost confusion, by reason of the divisions which reigned in it. Shawer, therefore, as soon as he heard of their approach, caused the ancient quarter called *Mesr* to be set on fire, and the inhabitants to retire into the other parts. He also prevailed upon the khalf to solicit the assistance of Nuroddin; which the latter was indeed pretty much inclined of himself to grant, as it gave him the fairest opportunity he could have wished for, both of driving the crusaders out of Egypt, and of seizing the kingdom

80
Conquests
of the
crusaders.

Egypt.

dom to himself. For this purpose he had already raised an army of 60,000 horse under his general Afadoddin; and, on the receipt of Al Aded's message, gave them orders to set out immediately. The crusaders were now arrived at Cairo; and had so closely besieged that place, that neither Shawer nor the khalif knew any thing of the approach of the Moslem army which was hastening to their relief. The vizir, therefore, finding it impossible to hold out long against the enemy, had recourse to his old subterfuge of treaties and high promises. He sent the enemy 100,000 dinars, and promised them 900,000 more, if they would raise the siege; which they, dreading the approach of Afadoddin, very readily accepted.

87
They are
repulsed by
the army of
Nuroddin
prince of
Damascus.

The army of Nuroddin now approached the capital by hasty marches, and were every where received with the greatest demonstrations of joy. Afadoddin, on his arrival at Cairo, was invited by Al Aden to the royal palace, where he was entertained in the most magnificent manner, and received several presents; nor were Saladin and the other principal officers less magnificently treated. Shawer also, conscious of his perfidious conduct, was no less assiduous in attending punctually upon him. But having invited the general and some others to an entertainment, he had formed a scheme of having them seized and murdered. The plot, however, being discovered, Shawer himself had his head cut off, and Afadoddin was made vizir in his stead. He did not, however, long enjoy his new dignity; for he died two months and five days after his instalment, being succeeded in his office of vizir by his nephew Saladin.

82
Saladin be-
comes vizir
of Egypt.

The new vizir was the youngest of all the grandees who aspired to that office, but had already given some signal proofs of his valour and conduct. What determined the khalif to prefer him to all the rest is not known; but it is certain that some of them were highly displeased with his promotion, and even publicly declared that they would not obey him. In order to gain these to his interest, therefore, Saladin found it necessary to distribute among them part of the vast treasures left by his uncle; by which means he soon governed Egypt without controul, as had been customary with the vizirs for some time before. Soon after his being installed into the office of vizir, he gave a total defeat to the negroes who guarded the royal palace, and had opposed his election; by which means, and a strong garrison he had placed in the castle of Cairo, his power became firmly established. Though he had not the least intention of continuing in his allegiance to Nuroddin, he did not think it prudent at first to declare himself. He sent for his father, however, and the rest of his family, who were in Nuroddin's dominions, in order, as he said, to make them partakers of his grandeur and happiness. Nuroddin did not think proper to deny this request; though, being already jealous of the great power of Saladin, he insisted that his family should consider him only as one of his generals in Egypt.

A good understanding subsisted between Nuroddin and Saladin for some time, which did not a little contribute to raise the credit of the latter with the Egyptians. In 1169, Nuroddin sent him orders to omit the name of Al Aded, the khalif of Egypt, in the public prayers, and substitute that of the khalif of Bagdad in its place. This was at any rate a dangerous at-

tempt; as it might very readily produce a revolt in favour of Al Aded; or if it did not, it gave Saladin an opportunity of engroffing even that small remnant of power which was left to the khalif. Al Aded, however, was not sensible of his disgrace; for he was on his death-bed, and past recovery, when Nuroddin's orders were executed. After his death, Saladin seized on all his wealth and valuable effects; which consisted of jewels of prodigious size, sumptuous furniture, a library containing 100,000 volumes, &c. His family he caused to be closely confined in the most private and retired part of the palace; and either manumitted his slaves, or kept them for himself, or disposed of them to others.

Egypt.

83
See the
effects of
the khalif.

Saladin was now arrived at the highest pitch of wealth, power, and grandeur. He was, however, obliged to behave with great circumspection with regard to Nuroddin; who still continued to treat him as his vassal, and would not suffer him to dispute the least of his commands. He relied for advice chiefly on his father Ayub; who was a consummate politician, and very ambitious of seeing his son raised to the throne of Egypt. He therefore advised Saladin to continue steadfast in his resolutions; and, whilst he amused Nuroddin with feigned submissions, to take every method in his power to secure himself in the possession of so valuable a kingdom. Nuroddin himself, however, was too great a master in the art of dissimulation to be easily imposed on by others; and therefore, though he pretended to be well pleased with Saladin's conduct, he was all this time raising a powerful army, with which he was fully determined to invade Egypt the following year. But while he meditated this expedition, he was seized with a quinsy at the castle of Damascus, which put an end to his life, in the year 1173.

84
Aspires to
the crown.

Saladin, though now freed from the apprehensions of such a formidable enemy, dared not venture to assume the title of *Sovereign*, while he saw the successor of Nuroddin at the head of a very powerful army, and no less desirous than able to dispossess him. For this reason his first care was to secure to himself an asylum, in case he should be obliged to leave Egypt altogether. For this purpose he chose the kingdom of Nubia; but having dispatched his brother Malek Turanah thither, at the head of a considerable army, the latter was so much struck with the sterility and desolate appearance of the country, that he returned without attempting any thing. Saladin then sent his brother into Arabia Felix, in order to subdue that country, which had been for some time held by Abdalnabi an Arabian prince. Malek entered the country without opposition; and having brought Abdalnabi to a general action, entirely defeated him, took him prisoner, and threw him into irons. He then over-ran and reduced under subjection to Saladin great part of the country, taking no fewer than 80 castles or fortresses of considerable strength.

85
Subdues A-
rabia Felix.

After this good fortune, Saladin, now sure of a convenient place of refuge in case of any misfortune, assumed the title of *Sultan* or sovereign of Egypt; and was acknowledged as such by the greater part of the states. The zeal of the Egyptians for the Fatemite khalifs, however, soon produced a rebellion. One *Al Kaniz*, or *Kanzanaddowla*, governor of a city in Upper Egypt, assembled a great army of blacks, or rather

86
Assumes
the title of
Sultan.

swartly

Egypt.

Barbarous natives; and marching directly into the lower country, was there joined by great numbers of other Egyptians. Against them Saladin dispatched his brother Malek, who soon defeated and entirely dispersed them. This, however, did not prevent another insurrection under an impostor, who pretended to be David the son of Al Aden the last Fatemite khalif, and had collected a body of 100,000 men. But before these had time to do any great damage, they were surprised by the sultan's forces, and entirely defeated. Above 300 were publicly hanged, and a vast number perished in the field, inasmuch that it was thought scarce a fourth part of the whole body escaped.

About this time Saladin gained a considerable advantage over the crusaders, commanded by William I. king of Sicily. That prince had invaded Egypt with a numerous fleet and army, with which he laid close siege to Alexandria both by sea and land. Saladin, however, marched to the relief of the city with such surprising expedition, that the crusaders were seized with a sudden panic, and fled with the utmost precipitation, leaving all their military engines, stores, and baggage behind.

87
Saladin made sovereign of Damascus.

In the year 1175, the inhabitants of Damascus begged of Saladin to accept the sovereignty of that city and its dependencies; being jealous of the minister, who had the tuition of the reigning prince, and who governed all with an absolute sway. The application was no sooner made, than the sultan set out with the utmost celerity to Damascus, at the head of a chosen detachment of 700 horse. Having settled his affairs in that city, he appointed his brother Saif Al Islam governor of it; and set out for Hems, to which he immediately laid siege. Having made himself master of this place, he then proceeded to Hamah. The city very soon surrendered, but the citadel held out for some time. Saladin pretended that he accepted the sovereignty of Damascus and the other places he had conquered, only as deputy to Al Malec Al Saleh, the successor of Nurroddin, and who was then under age; and that he was desirous of sending Azzoddin, who commanded in the citadel, with a letter to Aleppo, where the young prince resided. This so pleased Azzoddin, that he took the oath of fidelity to Saladin, and immediately set out with the sultan's letter. He had not, however, been long at Aleppo before he was by the minister's orders thrown into prison; upon which his brother, who had been appointed governor of the citadel Hamah in his absence, delivered it up to Saladin without further ceremony. The sultan then marched to Aleppo, with a design to reduce it; but, being vigorously repulsed in several attacks, he was at last obliged to abandon the enterprise. At the same time, Kamschlegin, Al Malek's minister or vizir, hired the chief of the Assassins, or Assassins*, to murder him. Several attempts were made in consequence of this application; but all of them, happily for Saladin, miscarried.

* See *Assassins* in the *Index*.

After raising the siege of Aleppo, Saladin returned to Hems, which place the crusaders had invested. On his approach, however, they thought proper to retire; after which, the sultan made himself master of the strong castle belonging to that place, which, before, he had not been able to reduce. This was soon followed by the reduction of Baalbec; and these rapid conquests so alarmed the ministers of Al Malek, that,

entering into a combination with some of the neighbouring princes, they raised a formidable army, with which they designed to crush the sultan at once. Saladin, fearing the event of a war, offered to cede Hems and Hamah to Al Malek, and to govern Damascus only as his lieutenant; but these terms being rejected, a battle ensued; in which the allied army was utterly defeated, and the shattered remains of it shut up in the city of Aleppo. This produced a treaty, by which Saladin was left master of all Syria, excepting only the city of Aleppo and the territory belonging to it.

In 1176 Saladin returned from the conquest of Syria, and made his triumphal entry into Cairo. Here, having rested himself and his troops for some time, he began to encompass the city with a wall 29,000 cubits in length, but which he did not live to finish. Next year he led a very numerous army into Palestine against the crusaders. But here his usual good fortune failed him. His army was entirely defeated. Forty thousand of his men were left dead on the field; and the rest fled with so much precipitation, that, having no towns in the neighbourhood where they could shelter themselves, they traversed the vast desert between Palestine and Egypt, and scarce stopped till they reached the capital itself. The greatest part of the army by this means perished; and as no water was to be had in the desert above mentioned, almost all the beasts died of thirst before the fugitives arrived on the confines of Egypt. Saladin himself seemed to have been greatly intimidated; for in a letter to his brother Al Malek, he told him, that "he was more than once in the most imminent danger; and that God, as he apprehended, had delivered him from thence, in order to reserve him for the execution of some grand and important design."

In the year 1182, the sultan set out on an expedition to Syria with a formidable army, amidst the acclamations and good wishes of the people. He was, however, repulsed with loss both before Aleppo and Al Mawfel, after having spent much time and labour in besieging these two important places.

In the mean time, a most powerful fleet of European ships appeared on the Red Sea, which threatened the cities of Mecca and Medina with the utmost danger. The news of this armament no sooner reached Cairo, than Abu Beer, Saladin's brother, who had been left viceroys in the sultan's absence, caused another to be fitted out with all speed under the command of Lulu, a brave and experienced officer; who quickly came up with them, and a dreadful engagement ensued. The Christians were defeated after an obstinate resistance, and all the prisoners butchered in cold blood. This proved such a terrible blow to the Europeans, that they never more ventured on a like attempt.

In 1183, Saladin continued to extend his conquests. The city of Amida in Mesopotamia surrendered to him in eight days; after which, being provoked by some

Egypt.
88
Defeats his enemies.

89
terrible overthrow from the crusaders.

90
The Christians receive a great defeat at sea.

91
Saladin's rapid conquests.

Egypt.

had formerly belonged to him, and being ready to attend the sultan on whatever expedition he pleased. After the conquest of Aleppo, Saladin took three other cities, and then marched against his old enemies the crusaders. Having sent out a party to reconnoitre the enemy, they fell in with a considerable detachment of Christians; whom they easily defeated, taking about 100 prisoners, with the loss of only a single man on their side. The sultan, animated by this first instance of success, drew up his forces in order of battle, and advanced against the crusaders, who had assembled their whole army at Sepphoris in Galilee. On viewing the sultan's troops, however, and perceiving them to be greatly superior in strength to what they had at first apprehended, they thought proper to decline an engagement, nor could Saladin with all his skill force them to it. But though it was found impossible to bring the crusaders to a decisive engagement, Saladin found means to harass them greatly, and destroyed great numbers of their men. He carried off also many prisoners, dismantled three of their strongest cities, laid waste their territories, and concluded the campaign with taking another strong town.

For three years Saladin continued to gain ground on the crusaders, yet without any decisive advantage; but in 1187, the fortune of war was remarkably unfavourable to them. The Christians now found themselves obliged to venture a battle, by reason of the cruel ravages committed in their territories by Saladin, and by reason of the encroachments he daily made on them. Both armies therefore being resolved to exert their utmost efforts, a most fierce and bloody battle ensued. Night prevented victory from declaring on either side, and the fight was renewed with equal obstinacy next day. The victory was still left undecided; but the third day the sultan's men finding themselves surrounded by the enemy on all sides but one, and there also hemmed in by the river Jordan, so that there was no room to fly, fought like men in despair, and at last gained a most complete victory. Vast numbers of the Christians perished on the field. A large body found means to retire in safety to the top of a neighbouring hill covered with wood; but being surrounded by Saladin's troops, who set fire to the wood, they were all obliged to surrender at discretion. Some of them were butchered by their enemies as soon as they delivered themselves into their hands, and others thrown into irons. Among the latter were the king of Jerusalem himself, Arnold prince of Al Shawbec and Al Carac, the masters of the Templars and Hospitalers, with almost the whole body of the latter. So great was the consternation of the Christians on this occasion, that one of Saladin's men is said to have taken 30 of them prisoners, and tied them together with the cord of his tent, to prevent them from making their escape. The masters of the Templars and Hospitalers, with the knights acting under them, were no sooner brought into Saladin's presence, than he ordered them all to be cut in pieces. He called them *Assissins* or *Batavists*; and had been wont to pay 50 dinars for the head of every Templar or Hospitaler that was brought him. After the engagement, Saladin seated himself in a magnificent tent, placing the king of Jerusalem on his right hand, and Arnold prince of Al Shawbec and Al

Carac on his left. Then he drank to the former, who was at that time ready to expire with thirst, and at the same time offered him a cup of snow-water. This was thankfully received; and the king immediately drank to the prince of Al Carac, who fat near him. But here Saladin interrupted him with some warmth: "I will not (says he) suffer this cursed rogue to drink; as that, according to the laudable and generous custom of the Arabs, would secure to him his life." Then, turning towards the prince, he reproached him with having undertaken the expedition while in alliance with himself, with having intercepted an Egyptian caravan in the time of profound peace, and massacring the people of which it was composed, &c. Notwithstanding all this, he told him, he would grant him his life, if he would embrace Mahometanism. This condition, however, was refused; and the sultan, with one stroke of his scimeter, cut off the prince's head. This greatly terrified the king of Jerusalem; but Saladin assured him he had nothing to fear, and that Arnold had brought on himself a violent death by his want of common honesty.

The crusaders being thus totally defeated and dispersed, Saladin next laid siege to Tiberias, which capitulated in a short time. From thence he marched towards Acca or Ptolemais, which likewise surrendered after a short siege. Here he found 4000 Mahometan prisoners in chains, whom he immediately released. As the inhabitants enjoyed at present a very extensive trade, the place being full of merchants, he found there not only vast sums of money, but likewise a great variety of wares exceedingly valuable, all which he seized and applied to his own use. About the same time his brother Al Malec attacked and took a very strong fortress in the neighbourhood; after which the sultan divided his army into three bodies, that he might win the greater facility over-run the territories of the Christians. Thus, in a very short time, he made himself master of Neapolis, Caesarea, Sepphoris, and other cities in the neighbourhood of Ptolemais, where his soldiers found only women and children, the men having been all killed or taken prisoners. His next conquest was Joppa, which was taken by storm after a vigorous resistance. Every thing being then settled, and a distribution made of the spoils and captives, Saladin marched in person against Tiberien, a strong fortress in the neighbourhood of Sidon; which was taken by assault, after it had sustained a siege of six days. No sooner was he master of this place, than he ordered the fortrefs to be razed, and the garrison put to the sword. From Tiberien the victorious sultan proceeded to Sidon itself; which, being deserted by its prince, surrendered almost on the first summons. Berytus was next invaded, and surrendered in seven days. Among the prisoners Saladin found in this place the prince of a territory called *Hobeil*, who by way of ransom delivered up his dominions to him, and was of consequence released. About the same time, a Christian ship, in which was a nobleman of great courage and experience in war, arrived at the harbour of Ptolemais, not knowing that it was in the hands of Saladin. The governor might easily have secured the vessel; but neglecting the opportunity, he escaped to Tyre, where the above mentioned nobleman, together with the prince of Hobeil, contributed not a little

Egypt.

93
His further
conquests.

92
Christians
totally de-
feated.

Egypt.

94
Jerusalem
taken.

to retrieve the affairs of the Christians, and enable them to make a stand for four years after.

Saladin in the mean time went on with his conquests. Having made himself master of Ascalon after a siege of 14 days, he next invested Jerusalem. The garrison was numerous, and made an obstinate defence; but Saladin having at last made a breach in the walls by sapping, the besieged desired to capitulate. This was at first refused; upon which the Christian ambassador made the following speech: "If that be the case, know, O sultan, that we who are extremely numerous, and have been restrained from fighting like men in despair only by the hopes of an honourable capitulation, will kill all our wives and children, commit all our wealth and valuable effects to the flames, massacre 5000 prisoners now in our hands, leave not a single beast of burden or animal of any kind belonging to us alive, and level with the ground the rock you esteem sacred, together with the temple Al Akfa. After this we will fall out upon you in a body; and doubt not but we shall either cut to pieces a much greater number of you than we are, or force you to abandon the siege." This desperate speech had such an effect upon Saladin, that he immediately called a council of war, at which all the general officers declared, that it would be most proper to allow the Christians to depart unmolested. The sultan therefore allowed them to march out freely and securely with their wives, children, and effects; after which he received ten dinars from every man capable of paying that sum, five from every woman, and two from every young person under age. For the poor who were not able to pay any thing, the rest of the inhabitants raised the sum of 30,000 dinars.

Most of the inhabitants of Jerusalem were escorted by a detachment of Saladin's troops to Tyre; and soon after, he advanced with his army against that place. As the port was blocked up by a squadron of five men of war, Saladin imagined that he should easily become master of it. But in this he found himself mistaken. For, one morning by break of day, a Christian fleet fell upon his squadron, and entirely defeated it; nor did a single vessel escape their pursuit. A considerable number of the Mahometans threw themselves into the sea during the engagement; most of whom were drowned, though some few escaped. About the same time Saladin himself was vigorously repulsed by land; so that, after calling a council of war, it was thought proper to raise the siege.

In 1188, Saladin, though his conquests were not so rapid and considerable as hitherto, continued still superior to his enemies. He reduced the city of Laodicea and some others, together with many strong castles; but met also with several repulses. At last he took the road to Antioch; and having reduced all the fortresses that lay in his way, many of which had been deemed impregnable, Bohemond prince of Antioch was so much intimidated, that he desired a truce for seven or eight months. This Saladin found himself obliged to comply with, on account of the prodigious fatigues his men had sustained, and because his auxiliaries now demanded leave to return home.

All these heavy losses of the Christians, however, proved in some respects an advantage, as they were thus obliged to lay aside their animosities, which had originally proved the ruin of their affairs. Those who

had defended Jerusalem, and most of the other fortresses taken by Saladin, having retreated to Tyre, formed there a very numerous body. This proved the means of preserving that city, and also of re-establishing their affairs for the present. For, having received powerful succours from Europe, they were enabled in 1189 to take the field with 30,000 foot and 2000 horse. Their first attempt was upon Alexandretta; from whence they dislodged a strong party of Mahometans, and made themselves masters of the place with very little loss. They next laid siege to Ptolemais; of which Saladin had no sooner received intelligence, than he marched to the relief of the place. After several skirmishes with various success, a general engagement ensued, in which Saladin was defeated with the loss of 10,000 men. This enabled the Christians to carry on the siege of Ptolemais with greater vigour; which place, however, they were not able to reduce for the space of two years.

This year the sultan was greatly alarmed by an account that the emperor of Germany was advancing to Constantinople with an army of 260,000 men, in order to assist the other crusaders. This prodigious armament, however, came to nothing. The multitude was so reduced with sickness, famine, and fatigue, that scarce 1000 of them reached the camp before Ptolemais. The siege of that city was continued, though with bad success on the part of the Christians. They were repulsed in all their attacks, their engines were burnt with naphtha, and the besieged always received supplies of provisions in spite of the utmost efforts of the besiegers; at the same time that a dreadful famine and pestilence raged in the Christian camp, which sometimes carried off 200 people a-day.

In 1191, the Christians received powerful succours from Europe. Philip II. of France, and Richard I. of England (from his great courage surnamed *Cœur de Lion*), arrived before the camp at Ptolemais. The latter was esteemed the bravest and most enterprising of all the generals the crusaders had; and the spirits of his soldiers were greatly elated by the thoughts of acting under such an experienced commander. Soon after his arrival, the English sunk a Mahometan ship of vast size, having on board 650 soldiers, a great quantity of arms and provisions, going from Berytus to Ptolemais. Of the soldiers and sailors who navigated this vessel, only a single person escaped; who being taken prisoner by the English, was dispatched to the sultan with the news of the disaster. The besieged still defended themselves with the greatest resolution; and the king of England happening to fall sick, the operations of the besiegers were considerably delayed. On his recovery, however, the attacks were renewed with such fury, that the place was every moment in danger of being taken by assault. This induced them to send a letter to Saladin, informing him, that if they did not receive succours the very next day, they would be obliged to submit. As this town was the sultan's principal magazine of arms, he was greatly affected with the account of their distress, especially as he found it impossible to relieve them. The inhabitants, therefore, found themselves under a necessity of surrendering the place. One of the terms of the capitulation was, that the crusaders should receive a very considerable sum of money from Saladin, in consequence

Egypt.

95
Crusaders
retrieve
their af-
fairs.

96

Richard I.
of England
arrives in
Asia.

Egypt.

quence of their delivering up the Mahometan prisoners they had in their hands. This article Saladin refused to comply with; and in consequence of his refusal, Richard caused 3000 of those unfortunate men to be slaughtered at once.

97
Defeats Sa-
ladin.

After the reduction of Ptolemais, the king of England, now made generalissimo of the crusaders, took the road to Afcalon, in order to besiege that place; after which, he intended to make an attempt upon Jerusalem itself. Saladin proposed to intercept his passage, and placed himself in the way with an army of 300,000 men. On this occasion was fought one of the greatest battles of that age. Saladin was totally defeated, with the loss of 40,000 men; and Afcalon soon fell into the hands of the crusaders. Other sieges were afterwards carried on with success, and Richard even approached within sight of Jerusalem, when he found, that, by reason of the weakened state of his army, and the divisions which prevailed among the officers who commanded it, he should be under the necessity of concluding a truce with the sultan. This was accordingly done in the year 1192; the term was, three years, three months, three weeks, three days, and three hours; soon after which the king of England set out on his return to his own dominions.

In 1193 Saladin died, to the inexpressible grief of all true Mahometans, who held him in the utmost veneration. His dominions in Syria and Palestine were shared out among his children and relations into many petty principalities. His son Othman succeeded to the crown of Egypt; but as none of his successors possessed the enterprising genius of Saladin, the history from that time to the year 1250 affords nothing remarkable. At this time the reigning sultan Malek Al Salck was dethroned and slain by the *Mamelucs* or *Mamluks*, as they are called, a kind of mercenary soldiers who served under him. In consequence of this revolution, the Mamelucs became masters of Egypt, and chose a sultan from among themselves.—These Mamlouks are thought to have been young Turks or Tartars, sold to private persons by the merchants, from whom they were bought by the sultan, educated at his expence, and employed to defend the maritime places of the kingdom.

99
Account of
them.

The reason of this institution originally was, that the native Egyptians were become so cowardly, treacherous, and effeminate, from a long course of slavery, that they were unfit for arms. The Mamlouks, on the contrary, made most excellent soldiers; for having no friends but among their own corps, they turned all their thoughts to their own profession. According to M. Volney, they came originally from Mount Caucasus, and are distinguished by the flaxen colour of their hair. Here they were found by the crusaders, and were by them called *Mamelucs*, or more correctly *Mamlouks*. The expedition of the Tartars in 1227 proved indirectly the means of introducing them into Egypt. These horrible conquerors, having slaughtered and massacred till they were weary, brought along with them an immense number of slaves of both sexes, with whom they filled all the markets in Asia. The Turks, taking advantage of the opportunity, purchased about 12,000 young men, whom they bred up in the profession of arms, in which they soon attained to great perfection; but becoming mutinous, like the

Egypt.

Roman pretorian bands, they turned their arms against their masters, and in 1250 deposed and murdered the khalif, as has been already related.

The Mamlouks having got possession of the government, and neither understanding nor putting a value upon any thing besides the art of war, every species of learning decayed in Egypt, and a great degree of barbarism was introduced. Neither was their empire of long duration notwithstanding all their martial abilities. The reason of this was, that they were originally only a small part of the sultan of Egypt's standing forces. As a numerous standing army was necessary in a country where the fundamental maxim of government was, that every native must be a slave, they were at first at a loss how to act; being justly suspicious of all the rest of the army. At last they resolved to buy Christian slaves, and educate them in the same way that they themselves had formerly been. These were commonly brought from Circassia, where the people, though they professed Christianity, made no scruple of selling their children. When they were completed in their military education, these soldiers were disposed of through all the fortresses erected in the country to bridle the inhabitants; and because in their language such a fort was called *Borge*, the new militia obtained the name of *Borgites*. By this expedient the Mamlouks imagined they would be able to secure themselves in the sovereignty. But in this they were mistaken. In process of time, the old Mamlouks grew proud, insolent, and lazy: and the Borgites, taking advantage of this, rose upon their masters, deprived them of the government, and transferred it to themselves about the year 1382.

160
Driven out
by the Bor-
gites.

The Borgites, as well as the former, assumed the name of *Mamlouks*; and were famous for their valour and ferocity of conduct. They were almost perpetually engaged in wars either foreign or domestic; and their dominion lasted till the year 1517, when they were invaded by Selim the Turkish sultan. The Mamlouks defended themselves with incredible valour; notwithstanding which, being overpowered by numbers, they were defeated in every engagement. The same year, their capital, the city of Cairo, was taken, with a terrible slaughter of those who defended it. The sultan was forced to fly; and, having collected all his force, ventured a decisive battle. The most romantic efforts of valour, however, were insufficient to cope with the innumerable multitude which composed the Turkish army. Most of his men were cut in pieces, and the unhappy prince himself was at last obliged to take shelter in a marsh. He was dragged from his hiding place, where he had stood up to the shoulders in water, and soon after put to death. With him ended the glory, and almost the existence, of the Mamlouks, who were now every where searched for and cut in pieces.

101
Egypt con-
quered by
Selim.

This was the last great revolution in the Egyptian affairs; a revolution very little to the advantage of the natives, who may well doubt whether their ancient or modern conquerors have behaved with the greater degree of barbarity. Selim gave a specimen of his government, the very day after his being put in full possession of it by the death of Tuman Bey the unfortunate sultan above mentioned. Having ordered a theatre to be erected with a throne upon it on the banks of the

^{Egypt.} Nile, he caufed all the prifoners, upwards of 30,000 in number, to be beheaded in his prefence, and their bodies thrown into the river.

¹⁰³ His horrid cruelty.

¹⁰³ New form of government introduced by Selim.

Notwithstanding this horrid cruelty of Selim, he did not attempt the total extermination of the race of Mamlouks, though this would have been quite agreeable to the maxims of Turkish policy; but in the prefent cafe he feems to have recollected, that if he eftablifhed a pacha in Egypt with the fame powers by which he invefted thofe of other parts, he would be under ftrong temptations to revolt by reafon of the diftance from the capital. He therefore propofed a new form of government, by which the power being diftributed among the different members of the ftate, fhould preferve an equilibrium, fo that the dependence of the whole fhould be upon himfelf. With this view, he chofe from among the Mamlouks who had efaped the general mafacre, a divan, or council of regency, confifting of the pacha and chiefs of the feven military corps. The former was to notify to this council the orders of the Porte, to fend the tribute to Conftantinople, and provide for the fafety of government both external and internal; while, on the other hand, the members of the council had a right to reject the orders of the pacha, or even of deposing him, provided they could affign fufficient reafons. All civil and political ordinances muft alfo be ratified by them. Befides this, he formed the whole body into a republic; for which purpofe he iffued an edict to the following purpofe: "Though, by the help of the Almighty, we have conquered the whole kingdom of Egypt with our invincible armies; nevertheless our benevolence is willing to grant to the 24 fangiacs (A) of Egypt a republican government, with the following conditions.

¹⁰⁴ His edict for a republic.

"I. That our fovereignty fhall be acknowledged by the republic; and in token of their obedience, our lieutenant fhall be received as our reprefentative: but to do nothing againft our will or the republic; but, on the contrary, fhall co-operate with it for its welfare on all occafions. Or if he fhall attempt to infringe any of its privileges, the republic is at liberty to fufpend him from his authority, and to fend to our Sublime Porte a complaint againft him, &c.

"II. In time of war, the republic fhall provide 12,000 troops at its own expence, to be commanded by a fangiac or fangiacs.

"III. The republic fhall raife annually and fend to our Sublime Porte the fum of 560,000 afiary (B), accompanied by a fangiac, who fhall have a fatisfactory receipt, &c.

"IV. The fame fum to be raifed for the ufe of Medina, and Kiabe or Mecca.

"V. No more troops or janizaries fhall be kept by the republic in time of peace than 14,000; but in time of war they may be increafed to oppofe our and the republic's enemies.

"VI. The republic fhall fend annually to our granary, out of the produce of the country, one million

of cafiz (C) or meafures of corn, viz. 600,000 of wheat and 400,000 of barley.

^{Egypt.}

"VII. The republic, fulfilling thefe articles, fhall have a free government over all the inhabitants of Egypt, independent of our lieutenant; but fhall execute the laws of the country with the advice of the mollah or high prieft under our authority and that of our fucceffors.

"VIII. The republic fhall be in poffeffion of the mint as heretofore; but with this condition, that it fhall be under the infpection of our lieutenant, that the coin may not be adulterated.

"IX. That the republic fhall elect a *fhiek bellet* out of the number of beys, to be confirmed by our lieutenant; and that the faid fhiek bellet fhall be our reprefentative, and fhall be efteemed by all our lieutenants, and all our officers both of high and low rank, as the head of the republic; and if our lieutenant is guilty of oppreffion, or exceeds the bounds of his authority, the faid fhiek bellet fhall reprefent the grievances of the republic to our Sublime Porte: but in cafe any foreign enemy or enemies difturb the peace of the republic, we and our fucceffors engage to protect it with our utmoft power until peace is re-eftablifhed, without any coft or expence to the republic.

"Given and figned by our clemency to the republic of Egypt."

Thus the power of the Mamlouks ftill continued in the Turk. ¹⁰⁵ a very confiderable degree, and by degrees increafed fo much as to threaten a total lofs of dominion to the Turks. During the laft 50 years, the Porte having loft

relaxed from its vigilance, fuch a revolution has taken place, that the Turkish power is now almoft reduced to nothing. But in order to underftand this, we muft confider the way in which the race of Mamlouks is continued or multiplied in Egypt. This is not in the ordinary way, by marriage: on the contrary, M. Volney affures us, that "during 550 years in which there have been Mamlouks in Egypt, not one of them has children of left fubfifting iffue; all their children perifh in the firft or fecond decient. Almoft the fame thing holds good with regard to the Turks; and it is obferved, that they can only fecure the continuance of their families by marrying women who are natives, which the Mamlouks have always difdained. The means by which they are perpetuated and multiplied are the fame by which they were firft eftablifhed, viz. by flaves brought from their original country. From the time of the Moguls this commerce has been continued on the banks of the Cuban and Phafis in the fame manner as it is carried on in Africa, by the wars among the hoftile tribes, and the mifery or avarice of the inhabitants, who fell their children to ftrangers. The flaves thus procured are firft brought to Conftantinople, and afterwards difperfed through the empire, where they are purchafed by the wealthy. When the Turks fubdued Egypt (fays M. Volney), they fhould undoubtedly have prohibited this dangerous traffic; their omitting

¹⁰⁶ Why the children of the Mamlouks and Turks all die in Egypt.

(A) Thefe fangiacs are the governors of provinces.

(B) Each of thefe coins is in value about half a crown Englifh; and the tribute fince that time has been augmented to 800,000 afiary, or about L. 100,000 Sterling.

(C) Each cafiz weighs 25 occa, and each occa is equal to two pounds ten ounces Englifh avoirdupoife weight.

Egypt.

ting which seems about to dispossess them of their conquest, and which several political errors have long been preparing.

"For a considerable time the Porte had neglected the affairs of this province; and in order to restrain the Paclias, had suffered the divan to extend its power till the chiefs of the janizaries and azabs were left without control. The soldiers themselves, become citizens by the marriages they had contracted, were no longer the creatures of Constantinople; and a change introduced into their discipline still more increased these disorders. At first the seven military corps had one common treasury; and though the society was rich, individuals, not having any thing at their own disposal, could effect nothing. The chiefs, finding their power diminished by this regulation, had interest enough to get it abolished, and obtained permission to possess distinct property, lands, and villages. And as these lands and villages depended on the Mamlouk governors, it was necessary to conciliate them to prevent their oppressions. From that moment the beys acquired an ascendancy over the soldiers, who till then had treated them with disdain; and this could not but continually increase, since their governments procured them considerable riches. These they employed in creating themselves friends and creatures. They multiplied their slaves; and after emancipating them, employed all their interest to promote them to various employments, and advance them in the army. These upstarts, retaining for their patrons the same superstitious veneration common in the East, formed factions implicitly devoted to their pleasure." Thus, about the year 1746, Ibrahim, one of the kiayas (D) of the janizaries, rendered himself in reality master of Egypt; having managed matters so well, that of the 24 beys or fanjias eight were of his household. His influence too was augmented by always leaving vacancies in order to enjoy the emoluments himself; while the officers and soldiers of his corps were attached to his interest; and his power was completed by gaining over Rodaan, the most powerful of all the colonels, to his interest. Thus the Pacha became altogether unable to oppose him, and the orders of the Sultan were less respected than those of Ibrahim. On his death in 1757, his family, *i. e.* his enfranchised slaves, continued to rule in a despotic manner. Waging war, however, among each other, Rodaan and several other chiefs were killed; until, in 1766, Ali Bey, who had been a principal actor in the disturbances, overcame his enemies, and for some time rendered himself absolute master of Egypt.

107
Authority
usurped by
Ibrahim
Kiaya.

108
History of
Ali Bey.

Of this man there are various accounts. The following is that given by M. Volney. He begins with observing, that the private history of the Mamlouks in general must be subject to great uncertainty, by reason of their being generally carried off from their parents at a time of life when they can remember but little or nothing of their parents; and he remarks, that they are likewise unwilling to communicate the little they may happen to remember. It is most commonly supposed, however, that Ali Bey was born among the Abazans, a people of Mount Cau-

casus; from whom, next to the Circassians, the slaves most valued by the Turks, and other nations who deal in that commodity, are to be obtained. Having been brought to a public sale at Cairo, Ali Bey was bought by two few brothers named Isaac and Yousef, who made a present of him to Ibrahim Kiaya. At this time he is supposed to have been about 13 or 14 years old, and was employed by his patron in offices similar to those of the pages belonging to European princes. The usual education was also given him; *viz.* that of learning to manage a horse well; fire a carbine and pistol; throw the djerid, a kind of dart used in the diversions of that country, and which shall be afterwards described. He was also taught the exercise of the sabre, and a little reading and writing. In all the feats of activity just mentioned, he discovered such impetuosity, that he obtained the surname of *Djendali*, or "madman;" and, as he grew up, discovered an ambition proportionable to the activity displayed in his youth. About the age of 18 or 20, his patron gave him his freedom; the badge of which among the Turks is the letting the beard grow, for among that people it is thought proper only for women and slaves to want a beard. By his kind patron also he was promoted to the rank of kacheef or governor of a district, and at last elected one of the 24 beys. By the death of Ibrahim in 1757, he had an opportunity of satisfying his ambition; and now engaged in every scheme for the promotion or disgrace of the chiefs, and had a principal share in the ruin of Rodaan Kiaya above mentioned. Rodaan's place was quickly filled by another, who did not long enjoy it; and in 1762 Ali Bey, then styled *Shah-el-Beked*, having got Abdelrahman, the possessor at that time, exiled, procured himself to be elected in his room. However, he soon shared the fate of the rest, being condemned to retire to Gaza. This place, being under the dominion of a Turkish pacha, was by no means agreeable; for which reason Ali having turned off to another place, kept himself concealed for some time, until in 1766 his friends at Cairo procured his recall. On this he appeared suddenly in that city; and in one night killed four of the beys who were inimical to his designs, banished the rest, and assumed the whole power to himself. Still, however, his ambition was not satisfied; and he determined on nothing less than to throw off his dependence on the Porte altogether, and become sultan of Egypt. With this view he expelled the pacha, refused to pay the accustomed tribute, and in the year 1768 proceeded to coin money in his own name. The Porte being at that time on the eve of a dangerous war with Russia, had not leisure to attend to the proceedings of Ali Bey; so that the latter had an opportunity of going forward with his enterprises very vigorously. His first expedition was against an Arabian prince named *Hammam*; against whom he sent an Arabian prince, his favourite Mohammed Bey, under pretence that the former had concealed a treasure entrusted with him by Ibrahim Kiaya, and that he afforded protection to rebels. Having destroyed this unfortunate prince, he next began to put in execution a plan proposed to him by

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He is
bought and
educated
by Ibrahim
Kiaya.

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He is ban-
ished, but
returns, and
throws off
the Turkish
yoke.

111
Overcomes
an Arabian
prince.

(D) These were the commanding officers of the janizaries, azabs, &c. who after the first year laid down their employments, and became veterans, with a voice in the divan.

Egypt.

112
Proposes to
make Meca
the emporium of
East India
commerce.

by a young Venetian merchant, of rendering Gedda, the port of Mecca, an emporium for all the commerce of India; and even imagined he should be able to make the Europeans abandon the passage to the Indies by the Cape of Good Hope. With this view, he fitted out some vessels at Suez; and manning them with Mamlouks, commanded the bey Hassan to sail with them to Gedda, and seize upon it, while a body of cavalry under Mohammed Bey advanced against the town. Both these commissions were executed according to his wish, and Ali became quite intoxicated with his success. Nothing but ideas of conquest now occupied his mind, without considering the immense disproportion between his own force and that of the Grand Signior. Circumstances, it must be owned, were at that time very favourable to his schemes. The Sheik Daher was in rebellion against the Porte in Syria; and the pacha of Damascus had so exasperated the people by his extortions, that they were ready for a revolt. Having therefore made the necessary preparations, Ali Bey dispatched in 1770 about 500 Mamlouks to take possession of Gaza, and thus secure an entrance into Palestine. Osman the pacha of Damascus, however, no sooner heard of the invasion than he prepared for war with the utmost diligence, while the troops of Ali Bey held themselves in readiness to fly on the first attack. They were relieved from their embarrassment by Sheik Daher, who hastened to their assistance, while Osman fled without even offering to make the least resistance; thus leaving the enemy masters of all Palestine without striking a stroke. About the end of February 1771, the grand army of Ali Bey arrived; which, by the representations made of it in Europe, was supposed to consist of 60,000 men. M. Volney, however, informs us, that this army was far from containing 60,000 soldiers; though he allows that there might be two-thirds of that number, who were classed as follows: 1. Five thousand Mamlouks, constituting the whole effective part of the army. 2. Fifteen hundred Arabs from Barbary on foot, constituting the whole infantry of the army. Besides these, the servants of the Mamlouks, each of whom had two, would constitute a body of 10,000 men. A number of other servants would constitute a body of about 2000; and the rest of the number would be made up by sutlers and other usual attendants on armies. It was commanded by Mohammed Bey the friend of Ali. "But (says our author) as to order and discipline, these must not be mentioned. The armies of the Turks and Mamlouks are nothing but a confused multitude of horsemen, without uniforms, on horses of all colours and sizes, without either keeping their ranks or observing any regular order." This rabble took the road to Acre, leaving wherever they passed sufficient marks of their rapacity and want of discipline. At Acre a junction was formed with the troops of Sheik Daher, consisting of 1500 Safadians (the name of Shaik Daher's subjects, from *Safad*, a village of Galilee, originally under his jurisdiction). They were on horseback, and accompanied by 1200 Mutualis cavalry under the command of Sheik Nasif, and about 1000 Mogrebin infantry. Thus they proceeded towards Damascus, while Osman prepared to oppose them by another army equally numerous and ill regulated: and M. Volney gives the following description of their operations.

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His expedition into
Syria.

114
Volney's
account of
his army.

"The reader must not here figure to himself a number of complicated and artificial movements; such as those which, within the last century, have reduced war with us to a science of system and calculation. The Asiatics are unacquainted with the first elements of this conduct. Their armies are mere mobs, their marches ravages, their campaigns inroads, and their battles bloody frays. The strongest or the most adventurous party goes in quest of the other, which frequently flies without making any resistance. If they stand their ground, they engage pell-mell, discharge their carbines, break their spears, and hack each other with their sabres; for they have seldom any cannon, and when they have, they are but of little service. A panic frequently diffuses itself without cause; one party flies, the other shouts victory; the vanquished submit to the will of the conqueror, and the campaign often terminates without a battle."

"Such, in a great measure, were the military operations in Syria in the year 1771. The combined army of Ali Bey and Sheik Daher marched to Damascus. The Pachas waited for them; they approached, and, on the 6th of June, a decisive action took place: the Mamlouks and Safadians rushed on the Turks with such fury, that, terrified at their courage, they immediately took to flight, and the Pachas were not the last in endeavouring to make their escape. The allies became masters of the country, and took possession of the city without opposition, there being neither walls nor soldiers to defend it. The castle alone resisted. Its ruined fortifications had not a single cannon, much less gunners; but it was surrounded by a muddy ditch, and behind the ruins were posted a few musketeers; and these alone were sufficient to check this army of cavalry. As the besieged, however, were already conquered by their fears, they capitulated the third day, and the place was to be surrendered next morning, when, at day-break, a most extraordinary revolution took place."

This was no less than the defection of Mohammed Bey himself, whom Osman had gained over in a conference during the night. At the moment, therefore, that the signal of surrender was expected, this treacherous general founded a retreat, and turned towards Egypt with all his cavalry, flying with as great precipitation as if he had been pursued by a superior army. Mohammed continued his march with such celerity, that the report of his arrival in Egypt reached Cairo only six hours before him. Thus Ali Bey found himself at once deprived of all his expectations of conquest; and what was worse, found a traitor whom he durst not punish at the head of his forces. A sudden reverse of fortune now took place. Several vessels laden with corn for Sheik Daher were taken by a Russian privateer; and Mohammed Bey, whom he designed to have put to death, not only made his escape, but was so well attended, that he could not be attacked. His followers continuing daily to increase in number, Mohammed soon became sufficiently strong to march towards Cairo; and, in the month of April 1772, having defeated the troops of Ali in a rencounter, entered the city sword in hand, while the latter had scarce time to make his escape with 800 Mamlouks. With difficulty only gets he was enabled to get to Syria by the assistance of Sheik Daher, whom he immediately joined with the troops

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115
Their absurd method of carrying on war.

116
Defection of Ali Bey's general.

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Egypt.

118
Defeats the
Turks, and
retrieves
his affairs.

troops he had with him. The Turks under Osman were at that time besieging Sidon, but raised the siege on the approach of the allied army, consisting of about 7000 cavalry. Though the Turkish army was at least three times their number, the allies did not hesitate to attack them, and gained a complete victory. Their affairs now began to wear a more favourable aspect; but the military operations were retarded by the siege of Yafa, a place which had revolted; and which, though defended only by a garden wall, without any ditch, held out for eight months. In the beginning of 1773 it capitulated, and Ali Bey began to think of returning to Cairo. For this purpose Sheik Daher had promised to furnish him with succours; and the Russians, with whom he had now contracted an alliance, made him a promise of the like kind. Ali, however, ruined every thing by his own impatience. Deceived by an astrologer, who pretended that the auspicious moment when he was highly favoured by the stars was just arrived, he would needs set out without waiting for the arrival of his allies. He was also farther deceived by a stratagem of Mohammed, who had by force extorted from the friends of Ali Bey letters pressing his return to Cairo, where the people were weary of his ungrateful slave, and wanted only his presence in order to expel him. Confiding in these promises, Ali Bey imprudently set out with his Mamlouks and 1500 Safadians given him by Daher; but had no sooner entered the desert which separates Gaza from Egypt, than he was attacked by a body of 1000 chosen Mamlouks who were lying in wait for his arrival. They were commanded by a young Bey, named *Mourad*; who, being enamoured of the wife of Ali Bey, had obtained a promise of her from Mohammed, in case he could bring him her husband's head. As soon as Mourad perceived the dust by which the approach of Ali Bey's army was announced, he rushed upon him, attacked and took prisoner Ali Bey himself, after wounding him in the forehead with a sabre. Being conducted to Mohammed Bey, the latter pretended to treat him with extraordinary respect, and ordered a magnificent tent to be erected for him; but in three days he was found dead of his wounds, as was given out; though some affirm, perhaps with equal reason, that he was poisoned.

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Is succeeded
by Mohammed
Bey.

After the death of Ali Bey, Mohammed Bey took upon him the supreme dignity; but this change of masters proved of very little service to the Egyptians. At first he pretended to be only the defender of the rights of the Sultan, remitted the usual tribute to Constantinople, and took the customary oath of unlimited obedience; after which he solicited permission to make war upon Sheik Daher, the ally of Ali Bey. The reason of this request was a mere personal pique; and as soon as it was granted, he made the most diligent preparations for war. Having procured an extraordinary train of artillery, he provided foreign gunners, and gave the command of them to an Englishman named Robinson. He brought from Suez a cannon 16 feet long, which had for a considerable time remained useless; and at length, in the month of February 1776, he appeared in Syria with an army equal in number to that which he had formerly commanded when in the service of Ali Bey. Daher's forces, despairing of being able to cope with such a formidable armament, abandoned Gaza, which Mohammed immediately took

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His expedition
against Sheik
Daher.

possession of, and then marched towards a fortified town named Yafa. The history of this siege M. Volney gives as a specimen of the Asiatic manner of conducting operations of that kind. "Yafa (says he), of the ancient Joppa, is situated on a part of the coast, at the general level of which is very little above the sea. The city is built on an eminence, in the form of a sugar loaf, in height about 130 feet perpendicular. The houses, distributed on the declivity, appear rising above each other, like the steps of an amphitheatre. On the summit is a small citadel, which commands the town; the bottom of the hill is surrounded by a wall without a rampart, of 12 or 14 feet high, and two or three in thickness. The battlements on the top are the only thickens by which it is distinguished from a common garden wall. This wall, which has no ditch, is environed by gardens, where lemons, oranges, and citrons grow in this light soil to a most prodigious size. The city was defended by five or six hundred Safadians and as many inhabitants, who, at the sight of the enemy, armed themselves with their sabres and muskets; they had likewise a few brass cannon, 24 pounders, without carriages; these they mounted as well as they could, on timbers prepared in a hurry; and supplying the place of experience by hatred and courage, they replied to the summons of the enemy with menaces and cannon-shot.

"Mohammed, finding he must have recourse to force, formed his camp before the town; but was so little acquainted with the business in which he was engaged, that he advanced within half cannon-shot. The bullets, which showered upon the tents, apprizing him of his error, he retreated; and, by making a fresh experiment, was convinced he was still too near. At length he discovered the proper distance, and set up his tent, in which the most extravagant luxury was displayed: around it, without any order, were pitched those of the Mamlouks, while the Barbary Arabs formed huts with the trunks and branches of the orange and lemon-trees, and the followers of the army arranged themselves as they could: a few guards were distributed here and there; and, without making a single entrenchment, they called themselves encamped.

"Batteries were now to be erected; and a spot of rising ground was made choice of to the south-eastward of the town, where, behind some garden walls, eight pieces of cannon were pointed, at 200 paces from the town; and the firing began, notwithstanding the mulketry of the enemy, who, from the tops of the terraces, killed several of the gunners.

"It is evident that a wall only three feet thick, and without a rampart, must soon have a large breach in it; and the question was not how to mount, but how to get through it. The Mamlouks were for doing it on horseback; but they were made to comprehend that this was impossible; and they consented, for the first time, to march on foot. It must have been a curious sight to see them, with their huge breeches of thick Venetian cloth, embarrassed with their tucked up *beniches*, their crooked sabres in hand, and pistols hanging to their sides, advancing and tumbling among the ruins of the wall. They imagined that they had conquered every difficulty when this obstacle was surmounted; but the besieged, who formed a better judgment, waited till they arrived at the empty space between

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Account of
the siege of
Yafa: a
specimen of
the Asiatic
method of
besieging
towns.

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between the city and wall ; where they assailed them from the terraces and windows of the houses with such a shower of bullets, that the Mamlouks did not so much as think of setting them on fire, but retired under a persuasion that the breach was utterly impracticable, since it was impossible to enter it on horseback. Morad Bey brought them several times back to the charge, but in vain.

“ Six weeks passed in this manner; and Mohammed was distracted with rage, anxiety, and despair. The besieged however, whose numbers were diminished by the repeated attacks, became weary of defending alone the cause of Daher. Some persons began to treat with the enemy; and it was proposed to abandon the place, on the Egyptians giving hostages. Conditions were agreed upon, and the treaty might be considered as concluded, when, in the midst of the security occasioned by this belief, some Mamlouks entered the town; numbers of others followed their example, and attempted to plunder. The inhabitants defended themselves, and the attack recommenced: the whole army then rushed into the town, which suffered all the horrors of war; women and children, young and old men, were all cut to pieces, and Mohammed, equally mean and barbarous, caused a pyramid formed of the heads of these unfortunate sufferers to be raised as a monument of his victory.”

By this disaster the greatest terror and consternation were every where diffused. Sheik Daher himself fled, and Mohammed soon became master of Acre also. Here he behaved with his usual cruelty, and abandoned the city to be plundered by his soldiers. The French merchants claimed an exemption, and it was procured with the utmost difficulty: nor was even this likely to be of any consequence; for Mohammed, informed that the treasures of Ibrahim Kiaya of Daher had been deposited in that place, made an immediate demand of them, threatening every one of the merchants with death if the treasures were not instantly produced. A day was appointed for making the research; but before this came, the tyrant himself died of a malignant fever after two days illness. His death was no sooner known than the army made a precipitate retreat, such as has been already mentioned from Damascus. Sheik Daher continued his rebellion for some time, but was at last entirely defeated, and his head sent to Constantinople by Hassan Pacha the Turkish high-admiral.

The death of Mohammed was no sooner known in Egypt, than Morad Bey hailed to Cairo in order to dispute the sovereignty with Ibrahim Bey, who had been entrusted with the government on his departure from that place for Syria. Preparations for war were made on both sides; but at last, both parties finding that the contest must be attended with great difficulty, as well as very uncertain in the event, thought proper to come to an accommodation, by which it was agreed that Ibrahim should retain the title of Shaik El Beled, and the power was to be divided between them. But now the beys and others who had been promoted by Ali Bey, perceiving their own importance totally annihilated by this new faction, resolved to shake off the yoke, and therefore united in a league under the title of *the House of Ali Bey*. They conducted their matters with so much silence and dexterity, that both Morad and Ibrahim were obliged to abandon Cairo. In

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a short time, however, they returned and defeated their enemies though three times their number; but notwithstanding this success, it was not in their power totally to suppress the party. This indeed was owing entirely to their unskilfulness in the art of war, and their operations for some time were very trifling. At last, a new combination having been formed among the beys, five of them were sentenced to banishment in the Delta. They pretended to comply with this order, but took the road of the desert of the Pyramids, through which they were pursued for three days to no purpose. At last they arrived safe at *Miniah*, a village situated on the Nile, 40 leagues above Cairo. Here they took up their residence, and being masters of the river, soon reduced Cairo to distress by intercepting its provisions. Thus a new expedition became necessary, and Ibrahim took the command of it upon himself. In the month of October 1783, he set out with an army of 3000 cavalry; the two armies soon came in sight of each other, but Ibrahim thought proper to terminate the affair by negotiation. This gave such offence to Morad, who suspected some plot against himself, that he left Cairo. A war betwixt the two rivals was now daily expected, and the armies continued for 25 days in sight of each other, only separated by the river. Negotiations took place; and the five exiled beys, finding themselves abandoned by Morad, took to flight, but were pursued and brought back to Cairo. Peace seemed now to be re-established; but the jealousy of the two rivals producing new intrigues, Morad was once more obliged to quit Cairo in 1784. Forming his camp, however, directly at the gates of the city, he appeared so terrible to Ibrahim, that the latter thought proper in his turn to retire to the desert, where he remained till March 1785. A new treaty then took place; by which the rivals agreed to share the power between them, though there was certainly very little probability that such a treaty would be long observed. Since that time we have no accounts of any remarkable transaction in Egypt; nor indeed can we reasonably expect any thing of consequence in a country where matters are managed, as M. Volney expresses himself, by a series of “ cabals, intrigues, treachery, and murders.”

Of late Egypt has been visited by several travellers, all of whom have published descriptions of the country, its productions, inhabitants, &c. The latest are M. Savary, M. Volney, the baron de Tott, and Mr Bruce; and from the accounts published by those gentlemen the following geographical description is principally compiled.

This country is still divided into two principal parts, Account of called the *Upper and Lower Egypt*. According to M. the country. Savary, the former is only a long narrow valley beginning at Sienna and terminating at Cairo. It is bounded by two chains of mountains running from north to south, and taking their rise from the last cataract of the Nile. On reaching the latitude of Cairo they separate to the right and left; the one taking the direction of mount Colzoum, the other terminating in some sand-banks near Alexandria; the former being composed of high and steep rocks, the latter of sandy hillocks over a bed of calcareous stone. Beyond these mountains are deserts bounded by the Red Sea on the east, and on the west by other parts of Africa; having

in

Egypt.

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The town
taken and
the inhabi-
tants mass-
cred.

124
Death of
Moham-
med Bey.

125
History of
Egypt from
that time
to the year
1786.

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Egypt. in the middle that long plain which, even where widest, is not more than nine leagues over. Here the Nile is confined in its course betwixt these insuperable barriers, and during the time of its inundation overflows the country all the way to the foot of the mountains; and Mr Bruce observes that there is a gradual slope from the bed of the river to those mountains on both sides. The baron de Tott says, that the mountains four leagues from the Nile, and facing Cairo, "are only a ridge of rocks about 40 or 50 feet high, which divide Egypt from the plains of Libya; which ridge accompanies the course of the river, at a greater or lesser distance, and seems as if only intended to serve as a bank to the general inundation."

Lower Egypt, according to M. Savary, comprehends all the country between Cairo, the Mediterranean, the Isthmus of Suez, and Libya. "This immense plain (says he) presents on the borders of its parching sands a stripe of lands cultivated along the canals of the river, and in the middle a triangular island to which the Greeks gave the name of *Delta*;" at the top of the angle of which the Baron de Tott informs us the rocks of Libya and the coasts of Arabia open and recede from each other towards the east and west, parallel to the Mediterranean. This great extent of country, from the kingdom of Barca to Gaza, is either overflowed by the river, or capable of being so; which thus fertilizes in a high degree a tract of country seemingly devoted to perpetual barrenness on account of the want of rain and the heat of the climate.

127
Coast of Egypt extremely low.

According to the testimonies of both Mr Bruce and M. Volney, the coast of Egypt is so extremely low, that it cannot be discovered at sea till the mariners come within a few leagues of it. In ancient times the sailors pretended to know when they approached this country by a kind of black mud brought up by their sounding-line from the bottom of the sea: but this notion, though as old as the days of Herodotus, has been discovered to be a mistake by Mr Bruce; who found the mud in question to arise while the vessel was opposite to the deserts of Barca. All along the coast of Egypt a strong current sets to the eastward.

128
Of the fertility of ancient and modern Egypt.

In former times Egypt was much celebrated for its fertility; and there is great reason to believe, that were the same pains bestowed upon the cultivation of the ground, and the distribution of the waters of the Nile in a proper manner, the same fertility would still be found to remain. The cause of decrease in the produce of Egypt we shall describe in the words of M. Savary. "The canals," says he, speaking of the Delta, "which used to convey fertility with their waters, are now filled. The earth no longer watered, and continually exposed to the burning ardour of the sun, is converted into a barren land. In those places where formerly were seen rich fields and flourishing towns, on the Pelusiac, the Tarsitic, and the Mendesian branches, which all strike out from the canal of Damietta, nothing is to be found at this day but a few miserable hamlets, surrounded by date-trees and by deserts. These once navigable canals are now no more than a vain resemblance of what they were: they have no communication with the lake Menzall, but what is merely temporary, on the swelling of the Nile; they are dry the remainder of the year. By deepening

them by removing the mud deposited by the river since the Turks have made themselves masters of Egypt, the country they pass through would be again fertilized, and the Delta recover a third of its greatness."

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Savary's account of the formation of the Delta.

Concerning this island, it has been the opinion of a great many, even from very ancient times, that it was produced by the mud brought down by the inundations of the Nile; and this opinion we find adopted in the strongest manner by M. Savary. His account of the supposed rise of the Delta, and indeed of the greatest part of Egypt, is to the following purpose. In those early ages where history has not fixed any epoch, a certain people descended from the mountains near the cataracts, into the valley overflowed by the Nile, and which was then an uninhabitable morass overgrown with reeds and canes. In what manner, or from what motive, these people were induced to descend from their ancient habitations to such a place, or how they found means to penetrate into a morass which he expressly tells us was *impenetrable*, we are not informed, neither is it to our present purpose to inquire. At that time, however, the sea bathed the feet of those mountains where the pyramids are built, and advanced far into Libya. It covered also part of the Isthmus of Suez, and every part of what we now call the Delta formed a great gulph. After many ages the Egyptians, by what means is unknown, at least not specified by our author (though they ought to have been so, as the country it seems was then overflowed not only by the river but by the ocean), formed canals to carry off the stagnant waters of the Nile; opposed strong dykes to its ravages; and, tired of dwelling in the caverns of rocks, built towns and cities upon spots elevated either by nature or art. Already the river was kept within its bounds, the habitations of men were out of the reach of its inundations, and experience had taught the people to foresee and announce them. One of the kings of Egypt undertook to change the course of the river. After running 150 leagues between the barriers already mentioned, meeting with an unfurmoutable obstacle to the right, it turned suddenly to the left; and taking its course to the southward of Memphis, it followed its waters thro' the sands of Libya. The prince we speak of caused a new bed to be dug for it to the east of Memphis; and by means of a large dyke obliged it to return between the mountains, and discharge itself into the gulph that bathes the rock on which the castle of Cairo is built. The ancient bed of the river was still to be seen in the time of Herodotus, and may even be traced at this day across the deserts, passing to the westward of the lakes of Natrum. The Arabs still borrow upon it the name of *Bahr Belama*, "or sea without water," and it is now almost choked up. To the labours of this monarch Egypt is indebted for the Delta. A reflux of the sea was occasioned by the enormous weight of the waters of the Nile, which precipitated themselves into the bottom of the gulph. Thus the sands and mud carried along with them were collected into heaps; and thus the Delta, at first very inconsiderable, rose out of the sea of which it repelled the limits. It was a gift of the river, and it has since been defended from the attacks of the ocean by raising dykes around it. Five hundred years before the Trojan war, according to Herodotus,

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Herodotus, the Delta was in its infancy; eight cubits of water being then sufficient to overflow it. Strabo tells us, that boats passed over it from one extremity to the other; and that its towns, built upon artificial eminences, resembled the islands of the Egean Sea. At the time that Herodotus visited this country, 15 cubits were necessary to cover all the Lower Egypt; but the Nile then overflowed the country for the space of two days journey to the right and left of the island. Under the Roman empire, 16 cubits performed the same effect. When the Arabs came to have the dominion, 17 cubits were requisite; and at this day 18 are necessary to produce a plentiful crop; but the inundation stops at Cairo and the neighbouring country, without being extended over the Lower Egypt. Sometimes, however, the Nile rises to 22 cubits; and the cause of this phenomenon is the mud for so many years accumulated on the island. Here, in the space of 3284 years, we see the Delta elevated 14 cubits. Our author wrote in 1777, and informs us that he twice made the tour of the island during the time of the inundation. "The river (says he) flowed in full streams in the great branches of Rosetta and Damietta, as well as in those which pass through the interior part of the country; but it did not overflow the lands, except in the lower parts, where the dykes were pierced for the purpose of watering the plantations of rice. We must not, however, imagine, as several travellers pretend, that this island will continue to rise, and that it will become unfruitful. As it owes its increase to the annual settling of the mud conveyed thither by the Nile, when it ceases to be overflowed it will no longer increase in height, for it is demonstrated that culture is not sufficient to raise land.

"It is natural to imagine that the Delta has increased in length as well as in height; and of this we may look upon the following fact to be a remarkable proof. Under the reign of Pflammiticus, the Milesians, with 30 vessels, landed at the mouth of the Bolbitine branch of the Nile, now called that of *Rosetta*, where they fortified themselves. There they built a town called *Metelis*, the same as *Fasûe*, which, in the Coptic vocabularies, has preserved the name of *Metfil*. This town, formerly a sea-port, is now nine leagues distant from the sea; all which space the Delta has increased in length from the time of Pflammiticus to the present. Homer, in his *Odyssey*, puts the following words in the mouth of Menelaus. 'In the stormy sea which washes Egypt, there is an island called *Pharos*. Its distance from the shore is such, that a vessel with a fair wind may make the passage in a day.' From the way in which he speaks of this island in other places, also, we may suppose that the island of *Pharos*, in his time, was not less than 20 leagues distant from the Egyptian coast, though now it forms the port of Alexandria; and this sentiment is confirmed by the most ancient writers.

"What prodigious changes great rivers occasion on the surface of the globe! How they elevate, at their mouths, islands which become at length large portions of the continent! It is true that the Nile has formed almost all the Lower Egypt, and created out of the waters the Delta, which is 90 leagues in circumference. It is thus that the Meander, constantly repelling the waves of the Mediterranean, and gradually fill-

ing up the gulph into which it falls, has placed in the middle of the land the town of Miletus, formerly a celebrated harbour. It is thus that the Tigris and the Euphrates, let loose from the Armenian hills, and sweeping with them in their course the sands of Mesopotamia, are imperceptibly filling up the Persian gulph."

These are the reasons assigned by M. Savary for thinking that the Delta, as well as the greatest part of the Lower Egypt, have been produced by the Nile; but this opinion is violently contested by other late travellers, particularly Mr Bruce, who has given a pretty long dissertation upon it, as well as many occasional remarks through the course of his work. He begins with observing, 1. That the country of Egypt is entirely a valley bounded by rugged mountains; whence it might seem natural to imagine that the Nile, overflowing a country of this kind, would be more ready to wash away the soil than to add to it. 2. It is observed by Dr Shaw, and the same is confirmed by our author, that there is a gentle slope from the middle of the valley to the foot of the mountains on each side; so that the middle, in which is the channel of the Nile, is really higher than any other part of the valley. Large trenches are cut across the country from the channel of the river, and at right angles with it, to the foot of the mountains. 3. As the river swells, the canals become filled with water, which naturally descending to the foot of the mountains, runs out at the farther end, and overflows the adjacent level country. 4. When the water, having attained the lowest ground, begins to stagnate, it does not acquire any motion by reason of the canal's being at right angles with the channel of the Nile, unless in the case of excessive rains in Ethiopia, when the water by its regurgitation again joins the stream. In this case, the motion of the current is communicated to the whole mass of waters, and every thing is swept away by them into the sea. 5. It has been the opinion of several authors, that there was a necessity for measuring the height of the inundation on account of the quantity of mud brought down annually by the waters, by which the land-marks were so covered, that the proprietors could not know their own grounds after the river subsided. But whatever might be the reason of this covering of the land-marks in ancient times, it is certain that the mud left by the Nile could not be so in the time of Herodotus, or during any period of time assigned by that historian; for he assigns only one foot of increase of soil throughout Egypt in an hundred years from the mud left by the river: the increase during one year, therefore, being only the hundredth part of a foot, could not cover any land-mark whatever. Besides, the Egyptian lands are at this day parted by huge blocks of granite, which frequently have gigantic heads at the ends of them; and these could not, at the rate mentioned by Herodotus, be covered in several thousand years. 6. The Nile does not now bring down any great quantity of mud; and it is absurd to suppose that it can at present bring down as much as it did soon after the creation, or the ages immediately succeeding the deluge. Throughout Abyssinia, according to the testimony of our author, the channel of every torrent is now worn to the bare rock, and almost every rivulet runs in a hard stony bed, all the loose earth being long ago washed away; so that an annual

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Mr Bruce's
reasons for
the contrary opi-
nion.

Egypt. and equable increase of the earth from the sediment of the waters is impossible. 7. Our author made a great number of trials of the water of the Nile during the time of its inundation in different places. At Baboeh, when just coming down from the cultivated parts of Abyssinia, and before it enters Sennar, the sediment is composed of fat earth and sand, and its quantity is exceedingly small. At the junction of the Nile and Aftaboras the quantity of sediment is very little augmented; consisting still of the same materials, but now mostly sand. At Syene the quantity of sediment was almost nine times greater than before; but was now composed almost entirely of sand, with a very small quantity of black earth. The conclusion of our author's experiments, however, is different from what we should have been led to expect from those just mentioned. "The experiment at Roetta (says he) was not so often repeated as the others: but the result was, that in the strength of the inundation the sediment consisted mostly of sand; and, towards the end, was much the greater part earth. I think these experiments conclusive, as neither the Nile coming fresh from Abyssinia, nor the Athara, though joined by the Mareb, likewise from the same country, brought any great quantity of soil from thence."

8. Our author goes on to observe, that had the Nile brought down the quantities of mud which it has been said to do, it ought to have been most charged with it at Syene; as there it contained the whole that was to be conveyed by it into Egypt. Instead of this, however, the principal part of the sediment at this place was sand; and this is very naturally accounted for from the vast quantities of sand taken up by the winds in the deserts between Gooz and Syene. Here our traveller frequently saw vast pillars of this kind of sand, which is so fine and light as to form an impalpable powder, traversing the desert in various directions. Many of these were driven upon the river; and when it became calm in the evening, fell down into it entirely; thus affording materials for the many sandy islands to be met with in the Nile.

9. Mr Bruce adopts the opinion of those who suppose that there has been a continual decrease of water since the creation of the world. In this case, therefore, if the land of Egypt had been continually increasing in height while the water that was to cover it decreased; there must have been frequent famines on account of the want of a sufficient inundation. But so far is this from being the case, that, according to the testimony of several Arabian MSS. there had not, when Mr Bruce was in Egypt, been one scarce season from the lowness of the inundation for 34 years; tho' during the same space they had three times experienced a famine by too great an abundance of water, which carried away the millet.

10. If there had been such an increase of land as Herodotus and others suppose, it must now have been very perceptible in some of the most ancient public monuments. This, however, is by no means the case. The base of every obelisk in Upper Egypt is to this day quite bare and visible. Near Thebes there are still extant two Colossal statues, plainly designed for nilometers, and which ought by this time to have been almost covered with earth; but notwithstanding the length of time there have remained there, they are still bare to the very base.

The strongest argument which the advocates for the increase of land of Egypt can make use of is, that the measures by which the quantity of inundation is determined are smaller now than in former times; and these small measures are said to have been introduced by the Saracens. On this Mr Bruce very justly observes, that such an expedient could not have answered any good purpose; as no decrease of the measure could have augmented the quantity of corn produced by the ground. M. Savary observes, that, to render his calculation concerning the growth of land in Egypt absolutely exact, it would be necessary to determine the precise length of the Greek, Roman, and Arabian cubit; and even to know the different alterations which that measure had undergone among these people: But this nicety he thinks needless; looking upon the general fact to be fully established by what he had said before. Mr Bruce, however, has treated the subject with much greater accuracy. He observes, that from the situation of Canopus, the distance betwixt Egypt and Cyprus, and the extension of the land to the northward, it appears that no addition of any consequence has been made to it for 3000 years past. The only argument left for the increase of land therefore must be taken from the nilometer. The use of this instrument was to determine the quantity of inundation, that so it might be known whether the crop would be sufficient to enable the people to pay the taxes exacted of them by the sovereign or not. The first step was to know what space of ground was overflowed in a given number of years; and this being determined by mensuration, the next thing was to ascertain the produce of the ground upon an average. Thus becoming acquainted with the greatest and least crops produced, together with the exact extent of ground overflowed, they were furnished with all the necessary principles for constructing a nilometer; and nothing now remained but to erect a pillar in a proper place, and divide it exactly into cubits. This was accordingly done; the pillar was first divided into cubits and these again were subdivided into digits. The first division of this kind was undoubtedly that mentioned in scripture, and called the *cubit of a man*; being the length of the arm from the middle of the round bone in the elbow to the point of the middle finger; a measure still in use among all rude nations. As no standard could be found by which this measure might be exactly determined, authors have differed very much concerning the true length of the cubit when reduced to our feet and inches. Dr Arbuthnot reckons two cubits mentioned in scripture; one of them containing one foot nine inches and $\frac{18}{100}$ of an inch; the other one foot and $\frac{8 \frac{1}{2}}{100}$ of a foot; but Mr Bruce is of opinion that both of these are too large. He found, by mensuration, the Egyptian cubit to be exactly one foot five inches and three-fifths of an inch; and Herodotus mentions, that in his time the cubit used for determining the increase of the Nile was the Samian cubit, about 18 of our inches. The latter also informs us, that in the time of Moeris, the minimum of increase was 8 cubits, at which time all Egypt below the city of Memphis was overflowed; but that in his time 16 or at least 15 cubits were necessary to produce the same effect. But to this account Mr Bruce objects, that Herodotus could have no certain information concerning the nilometer, because he himself says that the

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Opinions of various authors concerning the rise of the Nile in ancient times.

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priests, who alone had access to it, would tell him nothing of the matter. Herodotus also informs us, that in the time of Moeris, great lakes were dug to carry off the waters of the inundation; and this superfluous quantity Mr Bruce supposes to have been conveyed into the desert for the use of the Arabs, and that by such a vast drain the rise of the water on the nilometer would undoubtedly be diminished. But even granting that there was such a difference between the rise of the water in the time of Moeris and in that of Herodotus, it does not appear that any thing like it has appeared ever since. Strabo, who travelled into Egypt 400 years after the time of Herodotus, found that eight cubits were then the minimum, as well as in the time of Moeris. From some passages in Strabo, however, it appears that it required a particular exertion of industry to cause this quantity of water produce a plentiful crop; but there is not the least reason to suppose, that the very same industry was not necessary in the time of Moeris; so that still there is not any increase of land indicated by the nilometer. About 100 years afterwards, when the emperor Adrian visited Egypt, we are informed from unquestionable authority, that 16 cubits were the minimum when the people were able to pay their tribute; and in the fourth century, under the emperor Julian, 15 cubits were the standard; both which accounts correspond with that of Herodotus. Lastly, Procopius, who lived in the time of Justinian, informs us, that 18 cubits were then requisite for a minimum.

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No increase
of land in
these ages
can reason-
ably be sup-
posed;

From these accounts, so various and discordant, it is obvious that no certain conclusion can be drawn. It is not indeed easy to determine the reason of this difference in point of fact. The only conjecture we can offer is, that as it appears that by proper care a smaller quantity of water will answer the purpose of producing a plentiful crop, so it is not unreasonable to suppose that at different periods the industry of the people has varied so much as to occasion the disagreement in question. This would undoubtedly depend very much upon their governor; and indeed Strabo informs us that it was by the care of the governor Petronius, that such a small quantity of water was made to answer the purpose. The conclusion drawn by Mr Bruce from the whole of the accounts above related, is, that from them it is most probable that no increase of land has been indicated by the nilometer from the time of Moeris to that of Justinian.

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Nor in more mo-
dern times.

On the conquest of Egypt by the Saracens, their barbarous and stupid khalif destroyed the nilometer, causing another to be built in its stead, and afterwards fixed the standard of paying tribute considerably below what it had usually been. The Egyptians were thus kept in continual terror, and constantly watched the new nilometer to observe the gradual increase or decrease of the water. On this he ordered the new nilometer to be destroyed, and another to be constructed, and all access to it to be denied to the people. Which prohibition is still continued to Christians; though our author found means to get over this obstacle, and has given a figure of the instrument itself. That the people might not, however, be supposed to remain in total ignorance of their situation, he commanded a proclamation to be daily made concerning the height of the water, but in such an unintelligible manner that nobody was made any wiser; nor, according to our au-

thor, is the proclamation understood at this day. From his own observations, however, Mr Bruce concludes, that 15 cubits are now the minimum of inundation, and as this coincides with the accounts of it in the times of Herodotus and Adrian, he supposes with great probability, that the same quantity of water has been necessary to overflow this country from the earliest accounts to the present time.

It now remains only to take notice of what is said by M. Savary concerning the former distance of the island of Pharos from the land to which it is now joined. With regard to his other assertions concerning the city of Metelis having been once a sea-port, M. Volney proves that he has quoted Strabo unfairly, and consequently no stress is to be laid upon them. The principal, indeed the only, evidence therefore which remains, is the passage already quoted from Homer, viz. that "the island of Pharos is as far distant from one of the mouths of the Nile as a vessel can sail in one day before the wind." "But (says M. Volney) when Homer speaks of the distance of this island, he does not mean its distance from the shore opposite, as that traveller (M. Savary) has translated him, but from the land of Egypt and the river Nile. In the second place, by a day's sail we must not understand that indefinite space which the vessels, or rather the boats, of the ancient Greeks, could pass through in a day; but an accurate and determined measure of 540 stadia. This measure is ascertained by Herodotus, and is the precise distance between Pharos and the Nile, allowing, with M. d'Anville, 27,000 toises to 540 stadia. It is therefore far from being proved, that the increase of the Delta or of the continent was so rapid as has been represented; and, if we were disposed to maintain it, we should still have to explain how this shore, which has not gained half a league from the days of Alexander, should have gained eleven in the far shorter period from the time of Menelaus to that conqueror. The utmost extent of the encroachment of this land upon the sea, however, may be learned from the words of Herodotus; who informs us, that "the breadth of Egypt, along the sea-coast, from the gulph of Plinthine to the lake Serbonis near mount Casius, is 3600 stadia; and its length from the sea to Heliopolis 1500 stadia." Allowing therefore the stadium of Herodotus to be between 50 and 51 French toises, the 1500 stadia just mentioned are equal to 76,000 toises; which, at the rate of 57,000 to a degree, gives one degree and near 20 minutes and an half. But from the astronomical observations of M. Niebuhr, who travelled for the king of Denmark in 1761, the difference of latitude between Heliopolis, now called *Matarea*, and the sea, being one degree 29 minutes at Damietta, and one degree 24 minutes at Kofetta, there is a difference on one side of three minutes and an half, or a league and an half encroachment; and eight minutes and an half, or three leagues and an half on the other."

Thus the dispute concerning the augmentation of the land of Egypt by the Nile seems to be absolutely decided; and the encroachments of it on the sea so trifling, that we may justly doubt whether they exist, or whether we are not entirely to attribute the apparent differences to those which certainly take place betwixt the ancient and modern mensuration. M. Volney gives a very particular description of the face of the country; but takes notice of the inconveniences under which travellers labour in this country, by which it is rendered extremely difficult

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M. Sava-
ry's opinion
concerning
the site of
Pharos re-
ferred by M.
Volney.

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to say any thing certain with regard to the nature of the soil or mineral productions. These arise from the barbarity and superstition of the people, who imagine all the Europeans to be magicians and forcerers, who come by their magic art to discover the treasures which the genii have concealed under the ruins. So deep rooted is this opinion, that no person dares walk alone in the fields, nor can he find any one willing to accompany him; by which means he is confined to the banks of the river, and it is only by comparing the accounts of various travellers that any satisfactory knowledge can be acquired.

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Volney's
account of
the face of
the coun-
try.

According to this author, the entrance into Egypt at Rosetta presents a most delightful prospect, by the perpetual verdure of the palm-trees on each side, the orchards watered by the river, with orange, lemon, and other fruit-trees, which grow there in vast abundance; and the same beautiful appearance is continued all the way to Cairo. As we proceed farther up the river, he says, that nothing can more resemble the appearance of the country than the marshes of the lower Loire, or the plains of Flanders: instead, however, of the numerous trees and country-houses of the latter, we must imagine some thin woods of palms and ficamores, with a few villages of mud-walled cottages, built on artificial mounds. All this part of Egypt is very low and flat, the declivity of the river being so gentle, that its waters do not flow at a greater rate than one league in an hour. Throughout the country nothing is to be seen but palm-trees, single or in clumps, which become more rare in proportion as you advance; with wretched villages composed of huts with mud-walls, and a boundless plain, which at different seasons is an ocean of fresh water, a miry morass, verdant field, or a dusty desert; and on every side an extensive and foggy horizon, where the eye is wearied and diffused. At length, towards the junction of the two branches of the river, the mountains of Cairo are discovered on the east; and to the south-west three detached masses appear, which from their triangular form are known to be the pyramids. We now enter a valley which turns to the southward, between two chains of parallel eminences. That to the east, which extends to the Red Sea, merits the name of a mountain from its steepness and height, as well as that of a desert from its naked and savage appearance. Its name in the Arabic language is *Mokattam*, or the *bevan-mountain*. The western is nothing but a ridge of rock covered with sand, which has been very properly termed a *natural mound* or *causeway*. In short, that the reader may at once form an idea of this country, let him imagine on one side a narrow sea and rocks; on the other, immense plains of sand; and in the middle, a river, flowing through a valley of 150 leagues in length and from three to seven wide, which at the distance of 30 leagues from the sea separates into two arms; the branches of which wander over a soil almost free from obstructions, and void of declivity.

From comparing his own observations with those of other travellers, our author concludes, that the basis of all Egypt from *Afouan* (the ancient Syene) to the Mediterranean, is a continued bed of calcareous stone of whitish hue, and somewhat soft, containing the same kind of shells met with in the adjacent seas, and which forms the immense quarries extending from Saouadi to

Manfalout for the space of more than 25 leagues, according to the testimony of Father Sicard.

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Mr Bruce, however, gives us a much more particular account of the sources from whence were derived the vast quantities of marble met with in the remains of the ancient buildings in this country. These he discovered during his journey from Kenne to Cossier on the Red Sea, before he took his expedition to Abyssinia. He gives a most dismal idea of the deserts through which he passed. What houses he met with were constructed, like those M. Volney mentions, of clay, being no more than six feet in diameter, and about ten in height. The mountains were the most dreary and barren that can be imagined; and the heat of the sun so great, that two sticks rubbed together only for half a minute would take fire and flame. In these burning regions no living creature was to be met with, even the poisonous serpents and scorpions not being able to find subsistence. The first animal he saw was a species of ants in a plain called *Hamra* from the purple colour of its sand; and it was remarkable that these insects were of the same colour with the sand itself. No water was any where to be met with on the surface; though at a place called *Legeta* there were some draw-wells, the water of which was more bitter than foot itself. At *Hamra* the porphyry mountains and quarries begin, the stone of which is at first soft and brittle; but the quantity is immense, as a whole day was taken up in passing by them. These porphyry mountains begin in the latitude of nearly 24 degrees, and continue along the coast of the Red Sea to about 22° 30', when they are succeeded by the marble mountains; these again by others of alabaster, and these last by basaltic mountains. From the marble mountains our author selected twelve kinds, of different colours, which he brought along with him. Some of the mountains appeared to be composed entirely of red and others of green marble, and by their different colours afforded an extraordinary spectacle. Not far from the porphyry mountains the cold was so great, that his camels died on his return from Abyssinia, though the thermometer stood no lower than 42°.

Near to Cossier he discovered the quarries whence the ancients obtained those immense quantities of marble with which they constructed so many wonderful works. The first place where the marks of their operations were very perceptible, was a mountain much higher than any they had yet passed, and where the stone was so hard that it did not even yield to the blows of a hammer. In this quarry he observed that some ducts or channels for conveying water terminated; which, according to him, shows that water was one of the means by which these hard stones were cut. In four days, during which our author travelled among these mountains, he says, that he had "passed more granite, porphyry, marble, and jasper, than would build Rome, Athens, Corinth, Syracuse, Memphis, Alexandria, and half a dozen such cities." It appeared to him that the passages between the mountains and opening which he calls *desfes*, were not natural but artificial openings; where even whole mountains had been cut out, in order to preserve a gentle slope towards the river. This descent our author supposes not to be above one foot in 50; so that the carriages must have gone very easily, and rather required something to retard

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tard their velocity than any force to pull them forward. Concerning the mountains in general, he observes, that the porphyry is very beautiful to the eye, and is discovered by a fine purple sand without any glofs. An unvariegated marble of a green colour is generally met with in the same mountain; and where the two meet, the marble becomes soft for a few inches, but the porphyry retains its hardness. The granite has a dirty brown appearance, being covered with sand; but on removing this, it appears of a grey colour with black spots, with a reddish cast all over it. The granite mountains lie nearer to the Red Sea, and seem to have afforded the materials for Pompey's pillar. The redness above mentioned seems to go off on exposure to the air; but reappears on working or polishing the stone farther. The red marble is next to the granite, though not met with in the same mountain. There is also a red kind with white veins, and vast quantities of the common green serpentine. Some samples of that beautiful marble named *Ishella* were likewise observed; one of them of that yellowish cast called *quaker-colour*, the other of the bluish kind named *dove-colour*. The most valuable kind is that named *verde antico*, which is found next to the Nile in the mountains of serpentine. It is covered by a kind of blue fleaky stone, somewhat lighter than a slate, more beautiful than most kinds of marble, and when polished having the appearance of a volcanic lava. In these quarries the verde antico had been uncovered in patches of about 20 feet square. There were small pieces of African marble scattered about in several places, but no rocks or mountains of it; so that our author conjectures it to lie in the heart of some other kind. The whole is situated on a ridge with a descent to the east and west; by which means it might easily be conveyed either to the Nile or Red Sea, while the hard gravel and level ground would readily allow the heaviest carriages to be moved with very little force.

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Of a suppo-
sed eme-
rald mine.

Travellers have talked of an emerald mine in these deserts; but from the researches of Mr Bruce, it does not appear to have any existence. In the Red Sea indeed, in the latitude of $25^{\circ} 3'$, at a small distance from the south-western coast, there is an island called the *Mountain of Emeralds*; but none of these precious stones are to be met with there. Here, as well as on the continent, there were found many pieces of a green pellucid substance; but veined, and much softer than rock-crystal, though somewhat harder than glass. A few yards up the mountain he found three pits, which are supposed to have been the mines whence the ancients obtained the emeralds; but though many pieces of the green substance above mentioned were met with about these pits, no signs of the true emerald could be perceived. This substance, however, he conjectures to have been the *smaragdus* of the Romans. In the mountains of Cosseir, as well as in some places of the deserts of Nubia, our author found some rocks exactly resembling petrified wood.

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Stones of a
curious ap-
pearance.

The only metal said by the ancients to be produced in Egypt is copper. On the road to Suez are found great numbers of those stones called *Egyptian flints* and *pebbles*, though the bottom is a hard, calcareous, and sonorous stone. Here also M. Volney tells us, that the stones above mentioned, and which resemble petrified wood, are to be met with. These, he says, are

in the form of small logs cut slanting at the ends, and might easily be taken for petrifications, though he is convinced that they are real minerals.

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F. Sicard mentions two lakes, from the water of which is produced annually a great quantity of salt containing much mineral alkali; and M. Volney informs us, that the whole soil of this country is impregnated with salt; so that, upon digging to some depth in the ground, we always meet with brackish water impregnated in some degree with the mineral alkali as well as with common salt. The two lakes mentioned by Sicard are situated in the desert to the west of the Delta; and are three or four leagues in length, and about a quarter of a league in breadth, with a solid and stony bottom. For nine months in the year they are without water; but in the winter time they ooze out of the earth a reddish violet-coloured water, which fills the lakes to the height of five or six feet. This being evaporated by the return of the heat, there remains a bed of salt two feet thick and very hard, which is broken in pieces with iron bars; and no less than 30,000 quintals are procured every year from these lakes. So great is the propensity of the Egyptian soil to produce salt, that even when the gardens are overflowed for the sake of watering them, the surface of the ground, after the evaporation and absorption of the water, appears glazed over with salt. The water found in the wells contains mineral alkali, marine salt, and a little nitre. M. Volney is of opinion, that the fertile mould of Egypt, which is of a black colour, differs essentially from that of the other parts; and is derived from the internal parts of Ethiopia along with the waters of the Nile. This seems to contradict what he had before advanced against M. Savary concerning the increase of the land of Egypt by means of the waters of this river; but there is no reason at all to suppose this kind of earth to be of a foreign origin; it being always the result of vegetation and cultivation. Even the most barren and sandy spots in the world, if properly watered, and such vegetables planted in them as would grow there, in time would be covered with this black earth as well as others; and of this kind of artificial formation of soil travellers give us a remarkable instance in the garden of the monks at Mount Sinai, where the country is naturally as barren as in any place of the world. "The monks of Sinai (says Dr Shaw), in a long process of time, have covered over with dung and the sweepings of their convent near four acres of naked rocks; which produce as good cabbage, roots, fallad, and all kinds of pot-herbs, as any soil and climate whatsoever. They have likewise raised olive, plum, almond, apple, and pear trees, not only in great numbers, but of excellent kinds. The pears particularly are of such esteem at Cairo, that there is a present of them sent every year to the bashaw and persons of the first quality. Neither are their grapes inferior in size and flavour to any whatsoever: it being fully demonstrated, by what this little garden produces, how far an indefatigable industry can prevail over nature; and that several places are capable of culture and improvement which were intended by nature to be barren, and which the lazy and slothful have always suffered to be so."

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Salt lakes.

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Vegetable
mould of
Egypt not
originally
driven
from
Ethiopia.

From this general account of the country, we may reasonably conclude, that the natural fertility of E-
gypt

Egypt. Egypt is not diminished in modern times, provided the same pains were taken in the cultivation of it as formerly; but this is not to be expected from the present degenerate race of inhabitants. "The Delta (says Mr Savary) is at present in the most favourable state for agriculture. Washed on the east and west by two rivers formed by the division of the Nile, each of which is as large and more deep than the Loire, intersected by innumerable rivulets; it presents to the eye an immense garden, all the different compartments of which may be easily watered. During the three months that the Thebais is under water, the Delta possesses fields covered with rice, barley, vegetables, and winter fruits. It is also the only part of Egypt where the same field produces two crops of grain within the year, the one of rice, the other of barley."

142 Method of purifying and cooling the water in Egypt. The only cause of all this fertility is the Nile, without which the whole country would soon become an uninhabitable desert, as rain falls very seldom in this part of that world. It flows with a very gentle stream through the flat country, and its waters are very muddy, so that they must have time to settle, or even require filtration before they can be drunk. For purifying the water, the Egyptians, according to M. Volney, use bitter almonds, with which they rub the vessel containing it, and then the water becomes light and good; but on what principle this ingredient acts, we cannot pretend to determine. Unglazed earthen vessels filled with water are kept in every apartment; which by a continual evaporation through their porous substance, renders the contained fluid very cool even in the greatest heats*. The river continues muddy for six months; and during the three which immediately precede the inundation, the stream being reduced to an inconsiderable depth, becomes heated, green, fetid, and full of worms. The Egyptians in former times paid divine honours to the Nile, and still hold it in great veneration. They believe its waters to be very nourishing, and that they are superior to any in the world; an opinion very excusable in them, as they have no other, and large draughts of cold water are among their highest luxuries.

143 Of the inundation of the Nile. This river, swelled by the rains which fall in Abyssinia, begins to rise in Egypt about the month of May; but the increase is inconsiderable till towards the end of June, when it is proclaimed by a public crier thro' the streets of Cairo. About this time it has usually risen five or six cubits; and when it has risen to 16, great rejoicings are made, and the people cry out *Waf-fah Allah*, that is, that God has given them abundance. This commonly takes place about the latter end of July, or at farthest before the 20th of August; and the sooner it takes place, so much the greater are the hopes of a good crop. Sometimes, though rarely, the necessary increase does not take place till later. In the year 1705, it did not swell to 16 cubits till the 19th of September; the consequence of which was, that the country was depopulated by famine and pestilence.

We may easily imagine that the Nile cannot overflow the whole country of itself in such a manner as to render it fertile; for which reason there are innumerable canals cut from it across the country, as has already been observed, by which the water is conveyed to distant places, and almost every town or village

has one of these canals. In those parts of the country where the inundation does not reach, and where more water is required than it can furnish, as for watering of gardens, they must have recourse to artificial means for raising it from the river. In former times they made use of Archimedes's screw*; but that is now disused, and in place of it they have chosen the Persian *drustatia*. This is a large wheel turned by oxen, having a rope hung with several buckets which fill as it goes round, and empty themselves into a cistern at the top. Where the banks of the river are high, they frequently make a basin in the side of them, near which they fix an upright pole, and another with an axle across the top of that, at one end of which they hang a great stone, and at the other a leathern bucket; this bucket being drawn down into the river by two men, is raised by the descent of the stone, and emptied into a cistern placed at a proper height. This kind of machine is used chiefly in the upper parts of the country, where the raising of water is more difficult than in places near the sea. When any of their gardens or plantations want water, it is conveyed from the cisterns into little trenches, and from thence conducted all round the beds in various rills, which the gardener easily stops by raising the mould against them with his foot, and diverts the current another way as he sees occasion.

The rise of the inundation is measured, as has already been observed, by an instrument adapted for the purpose, and called *nilometer*, which we translate *nilometer*. Mr Bruce informs us, that this is placed between Geeza and Cairo, on the point of an island named *Rhoda*, about the middle of the river, but somewhat nearer to Geeza. It is a round tower with an apartment, in the middle of which is a cistern neatly lined with marble. The bottom of this cistern reaches to that of the river, and there is a large opening by which the water has free access to the inside. The rise of the water is indicated by an octagonal column of blue and white marble, on which are marked 20 peeks or cubits of 22 inches each. The two lower most of these have no subdivisions; but each of the rest is divided into 24 parts call *digits*; the whole height of the pillar being 36 feet 8 inches.

When the river has attained its proper height, all the canals are opened, and the whole country laid under water. During the time of the inundation a certain vortical motion of the waters takes place; but notwithstanding this, the Nile is so easily managed, that many fields lower than the surface of its waters are preserved from injury merely by a dam of moistened earth not more than eight or ten inches in thickness. This method is made use of particularly in the Delta when it is threatened with a flood.

As the Nile does not always rise to an height sufficient for the purposes of agriculture, the former sovereigns of Egypt were at vast pains to cut proper canals in order to supply the deficiency. Some of these are still preserved; but great numbers are rendered useless through the indolence or barbarity of their successors. Those which convey the water to Cairo, into the province of Fayoom, and to Alexandria, are best taken care of by government. The last is watched by an officer appointed for that purpose, whose office it is to hinder the Arabs of Bachria, who receive this superfluous water, from turning it off before Alexandria be

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provided for, or opening it before the proper time, which would hinder the increase of the river. In like manner, that which conveys the water to Fayoom is watched, and cannot be opened before that of Cairo, which is called the *Canal of Trajan*. A number of other canals, only taken care of by those who derive advantage from them, proceed from that arm of the Nile which runs to Damietta, and fertilize the province of Sharkia; which, making part of the isthmus of Suez, is the most considerable of Egypt, and the most capable of a great increase of cultivation. The plains of Gaza which lie beyond, and are possessed by the Arabs, would be no less fertile, were it not for the excessive inclination these people have to destroy, so that they make war even with the spontaneous productions of the earth. A number of other canals run through the Delta; and the vestiges of those which watered the provinces to the eastward and westward, show that in former times these were the best cultivated parts of Egypt. "We may also presume (says the Baron de Tott), from the extent of the ruins of Alexandria, the construction of the canal, and the natural level of the lands which encompass the lake Mareotis, and extend themselves westward to the kingdom of Barca, that this country, at present given up to the Arabs, and almost desert, was once sufficiently rich in productions of every kind to furnish the city of Alexandria with its whole subsistence."

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Air and
climate of
Egypt.

The air and climate of Egypt are extremely hot, not only from the height of the sun, which in summer approaches to the zenith, but from the want of rain and from the vicinity of those burning and sandy deserts which lie to the southward. In the months of July and August, according to M. Volney, Reaumur's thermometer stands, even in the most temperate apartments, at the height of 24 or 25 degrees above the freezing point; and in the southern parts it is said to rise still higher. Hence, he says, only two seasons should be distinguished in Egypt, the cool and the hot, or spring and summer. The latter continues for the greatest part of the year, viz. from March to November or even longer; for by the end of February the sun is intolerable to an European at nine o'clock in the morning. During the whole of this season, the air seems to be inflamed, the sky sparkles, and every one sweats profusely, even without the least exercise, and when covered with the lightest dress. This heat is tempered by the inundation of the Nile, the fall of the night-dews, and the subsequent evaporation; so that some of the European merchants, as well as the natives, complain of the cold in winter. The dew we speak of does not fall regularly throughout the summer, as with us; the parched state of the country not affording a sufficient quantity of vapour for this purpose. It is first observed about St John's day (June 24th), when the river has begun to swell, and consequently a great quantity of water is raised from it by the heat of the sun, which being soon condensed by the cold of the night air, falls down in copious dews.

It might naturally be imagined, that as for three months in the year Egypt is in a wet and marshy situation, the excessive evaporation and putrefaction of the stagnating waters would render it very unhealthy. But this is by no means the case. The great dryness

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of the air makes it absorb vapours of all kinds with the utmost avidity; and these rising to a great height, are carried off by the winds either to the southward or northward, without having time to communicate any of their pernicious effects. This dryness is so remarkable in the internal parts of the country, that flesh meat exposed to the open air does not putrefy even in summer, but soon becomes hard and dry like wood. In the deserts there are frequently dead carcases thus dried in such a manner, and become so light, that one may easily lift that of a camel with one hand. In the maritime parts, however, this dryness of the air is not to be expected. They discover the same degree of moisture which usually attends such situations. At Rosetta and Alexandria, iron cannot be exposed to the air for 24 hours without rusting. According to M. Volney, the air of Egypt is also strongly impregnated with salts; for which opinion he gives the following reason. "The stones are corroded by natrum (mineral alkali), and in moist places long crystallizations of it are to be found, which might be taken for salt-petre. The wall of the Jesuits garden at Cairo, built with earth and bricks, is every where covered with a crust of this natrum as thick as a crown-piece: and when this garden has been overflowed by the waters of the kalidj (canal), the ground, after they have drained off, appears sparkling on every side with crystals, which certainly were not brought thither by the water, as it shows no sign of salt either to the taste or by distillation."—But whatever may be the quantity of salt contained in the earth, it is certain that M. Volney's opinion of its coming thither from the air cannot be just. The salt in question is excessively fixed, and cannot be diffipated into the air without the violent heat of a glass-house furnace; and even after this has been done, it will not remain diffused through the atmosphere, but quickly falls back again. No experiments have ever shown that any salt was or could be diffused in the air, except volatile alkali, and this is now known to be formed by the union of two permanently elastic fluids; and it is certain that a salting air would quickly prove fatal to the animals who breathed it. The abundance of this kind of salt in Egypt therefore only shows, that by some unknown operation the heat of the sun forms it from the two ingredients of earth and water, though we do not yet understand the manner, nor are able to imitate this natural operation.

To this saline property of the earth M. Volney ¹⁴⁷ ascribes the excessive quickness of vegetation in Egypt, plants will which is so great, that a species of gourd called *karanor* thrive well, in 24 hours, send forth shoots of four inches in ⁱⁿ Egypt-length; but for the same reason, in all probability, it is that no exotic plant will thrive in Egypt. The merchants are obliged annually to send to Malta for their garden seeds; for though the plants thrive very well at first, yet if the seed of them is preserved, and sown a second year, they always come up too tall and slender.

By reason of the great dryness of the air, Egypt is exempted from the phenomena of rain, hail, snow, thunder and lightning. Earthquakes are also seldom heard of in this country; though sometimes they have been very fatal and destructive, particularly one in the year 1112. In the Delta, it never rains in

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summer, and very seldom at any other time. In 1761, however, such a quantity of rain unexpectedly fell, that a great number of houses, built with mud-walls, tumbled entirely down by being soaked with the water, to which they were unaccustomed. In the Higher Egypt the rain is still less frequent; but the people, sensible of the advantages which accrue from it, always rejoice when any falls, however insufficient to answer the purpose. This deficiency of rain is supplied by the inundation and dews already mentioned. The latter proceed, as has already been said, partly from the waters of the inundation and partly from the sea. At Alexandria, after sunset, in the month of April, the clothes exposed to the air and the terraces are soaked with them as if it had rained. These dews are more or less copious according to the direction of the wind. They are produced in the greatest quantity by the westerly and northerly winds, which blow from the sea; but the south and south-east winds, blowing over the deserts of Africa and Arabia, produce none.

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Remark-
able regu-
larity of the
winds.

The periodical return of winds from a certain quarter is a very remarkable phenomenon in this country. When the sun approaches the tropic of Cancer, they shift from the east to the north; and, during the month of June, they always blow from the north or north-west. They continue northerly all the month of July, varying only sometimes towards the east, and sometimes the contrary way. About the end of this month, and during the whole of August and September, they blow directly from the north, and are but of a moderate strength, though somewhat weaker in the night than in the day. Towards the end of September they return to the east, though they do not absolutely fix on that point, but blow more regularly from it than any other except the north. As the sun approaches the southern tropic, they become more variable and tempestuous, blowing most commonly from the north, north-east, and west, which they continue to do throughout the months of December, January, and February; and, during that season, the vapours raised from the Mediterranean condense into mist, or even sometimes into rain. Towards the end of February, and in the succeeding month, they more frequently blow from the south than from any other quarter. During some part of the month of March and in that of April, they blow from the south, south-east, and south-west; sometimes from the north and east, the latter becoming most prevalent about the end of that month, and continuing during the whole of May.

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Rains in
Abyssinia
and in Ar-
menia are
occasioned by
two opposite
currents of
fair.

It is to the long continuance of the north winds, formerly called the *Etesians winds*, that Egypt probably owes its extreme dryness, as well as part of the inundation by which it is fertilized. From the month of April to July, there appear to be two immense currents in the atmosphere, the under one blowing from the north, and the upper from the south. By the former the vapours are raised from the Mediterranean and southern parts of Europe, where they are carried over Abyssinia, dissolving there in immense deluges of rain; while by the latter the superfluous vapours, or those raised from the country of Abyssinia itself, are carried northward toward the sources of the Euphrates. Here the clouds coming from the south, descending into the lower part of the atmosphere, dissolve in like

manner into rain, and produce an inundation of the Euphrates similar to that of the Nile, and immediately succeeding it. Mr Bruce had an opportunity of ascertaining this fact in the month of June 1768; for at that time, while on a voyage from Sidon to Alexandria, he observed great numbers of thin white clouds moving rapidly from the south, and in direct opposition to the Etesian winds.

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Besides the ordinary winds here spoken of, Egypt is infested with the destructive blaits common to all warm countries which have deserts in their neighbourhood. These have been distinguished by various names, such as *poisonous winds*, *hot winds of the desert*, *Samiel*, the *wind of Damascus*, *Kamshin*, and *Simsom*. In Egypt they are denominated "winds of 50 days," because they most commonly prevail during the 50 days preceding and following the equinox; though, should they blow constantly during one half of that time, an universal destruction would be the consequence. Of these travellers have given various descriptions. M. Volney says, that the violence of their heat may be compared to that of a large oven at the moment of drawing out the bread. They always blow from the south; and are undoubtedly owing to the motion of the atmosphere over such vast tracts of hot sand, where it cannot be supplied by a sufficient quantity of moisture. When they begin to blow, the sky loses its usual serenity, and assumes a dark, heavy, and alarming aspect, the sun himself laying aside his usual splendor, and becoming of a violet colour. This terrific appearance seems not to be occasioned by any real haze or cloud in the atmosphere at that time, but solely to the vast quantity of fine sand carried along by those winds, and which is so excessively subtle that it penetrates every where. The motion of this sand is always rapid, but its heat is not intolerable till after it has continued for some time. Its pernicious qualities are evidently occasioned by its excessive avidity of moisture. Thus it dries and shrivels up the skin; and by doing the same to the lungs, will in a short time produce suffocation and death. The danger is greatest to those of a plethoric habit of body, or who have been exhausted by fatigue; and putrefaction soon takes place in the bodies of such as are destroyed by it. Its extreme dryness is such, that water sprinkled on the floor evaporates in a few minutes; all the plants are withered and tripped of their leaves; and a fever is instantly produced in the human species by the suppression of perspiration. It usually lasts three days, but is altogether insupportable if it continue beyond that time. The danger is greatest when the wind blows in squalls, and to travellers who happen to be exposed to its fury without any shelter. The best method in this case is to stop the nose and mouth with an handkerchief. Camels, by a natural instinct, bury their noses in the sand, and keep them there till the squall is over. The inhabitants, who have an opportunity of retiring to their houses, instantly shut themselves up in them, or go into pits made in the earth, till the destructive blast be over.

The description of a blast of this kind which overtook Mr Bruce in the desert of Nubia is still more terrible than that just given from M. Volney. We have already mentioned something of the pillars of moving sand raised by the winds in the desert. These were observed by our traveller on this occasion in all their ter-

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ric majesty. Sometimes they appeared to move slowly; at other times with incredible swiftness, so that they could not have been avoided by the fleetest horse. Sometimes they came so near, that they threatened destruction to the whole company. Frequently the tops, when arrived at an immense height, so that they were lost in the clouds, suddenly separated from the bodies, and dispersed themselves in the air; and sometimes the whole column broke off near the middle, as if it had received a cannon shot; and their size was such, that, at the distance of about three miles, they appeared ten feet in diameter. Next day they appeared of a smaller size, but more numerous, and sometimes approached within two miles of the company. The sun was now obscured by them, and the transmutation of his rays gave them a dreadful appearance, resembling pillars of fire. This was pronounced by the guide to be a sign of the approaching *Sinoom* or hot wind; and he directed, that, when it came, the people should fall upon their faces and keep their mouths on the sand, to avoid the drawing in this pernicious blast with their breath. On his calling out that the *Sinoom* was coming, Mr Bruce turned for a moment to the quarter from whence it came, which was the south-east. It appeared like a haze or fog of purple colour, but less bright than the purple part of the rainbow; seemingly about 20 yards in breadth, and about 12 feet high from the ground. It moved with such rapidity, that before he could turn about and fall upon his face, he felt the vehement heat of its current upon his face; and even after it passed over, which was very quickly, the air which followed was of such an heat as to threaten suffocation. Mr Bruce had unfortunately inspired some part of the pernicious blast; by which means he almost entirely lost his voice, and became subject to an asthmatic complaint, from which he did not get free for two years. The same phenomenon occurred twice more on their journey thro' this desert. The second time, it came from the south a little to the east: but it now seemed to have a shade of blue along with the purple, and its edges were less perfectly defined; resembling rather a thin smoke, and having about a yard in the middle tinged with blue and purple. The third time, it was preceded by an appearance of sandy pillars more magnificent than any they had yet observed; the sun shining through them in such a manner as to give those which were nearest a resemblance of being spangled with stars of gold. The *sinoom* which followed had the same blue and purple appearance as before, and was followed by a moist suffocating wind for two hours, which reduced our travellers to the lowest degree of weakness and despondency. It was remarkable that this wind always came from the south-east, while the sandy pillars, which prognosticated its approach, affected to keep to the westward, and to occupy the vast circular space inclosed by the Nile to the west of their route, going round by Chaigie towards Dongola. The heaps of sand left by them when they fell, or raised by the whirlwinds which carried them up, were 12 or 13 feet high, exactly conical, tapering to a fine point, and their bases well proportioned.

152.
Of the inhabitants of into four distinct races of people.

1. The *Arabi*, who may be subdivided into three

classes. 1. The posterity of those who settled here immediately after the conquest of the country by Amrou Ebn Al As the khalif Omar's general. 2. The *Magrebians*, or Western Arabs, who at different times have migrated from the countries to the westward of Egypt, and are descended from the Saracen conquerors of Mauritania. 3. The *Bedouins*, or Arabs of the desert, known to the ancients by the name of *Scenites*, or dwellers in tents. The first of these classes are now found among the husbandmen and artisans; and are distinguished from the others by being of a more robust habit of body, as well as of a larger stature than the others. They are in general five feet four inches high; and many of them attain two or three inches more, and are muscular without being fleshy. Their countenances are almost black, but their features are not disagreeable; and as those of the country do not ally themselves in marriage but with the people of their own tribe, their faces have all a strong resemblance to each other. This is not the case with such as live in towns, by reason of their promiscuous marriages. The second class are more numerous in the Said, where they have villages and even distinct sovereigns of their own. Like the former, they apply themselves to agriculture and mechanical occupations. The *Bedouins* pass their lives among the rocks, ruins, and sequestered places where they can find water; sometimes uniting in tribes and living in low smoky tents, and shifting their habitations from the desert to the banks of the river and back again, as best suits their convenience. Their time of inhabiting the desert is the spring; but after the inundation they take up their residence in Egypt, in order to profit by the fertility of the country. Some farm lands in the country which they cultivate, but change annually. In general, all these *Bedouins* are robbers, and are a great terror to travellers as well as to the husbandmen; but though their number is estimated at not less than 30,000, they are dispersed in such a manner that they cannot attempt any thing of consequence.

II. The *Copts* are descendants of those inhabitants of Egypt whom the Arabs subdued, and who were composed of original Egyptians, Persians, and Greeks. M. Volney is of opinion that their name of *Copts* is only an abbreviation of the Greek word *Aigouptios*, an Egyptian. They are principally to be met with in the Said, though some also inhabit the Delta. They have all a yellowish dusky complexion, puffed up visage, swollen eyes, flat noses, and thick lips; and in fact the exact countenance of a mulatto. M. Volney, from a view of the sphynx, and finding its features to be such as is just now described, concludes, that the ancient Egyptians were real negroes; which he thinks is likewise confirmed by a passage in Herodotus, where he concludes, that the inhabitants of Colchis were descended from the Egyptians, "on account of the blackness of their skins and frizzled hair." M. Volney also remarks, that the countenance of the negroes is such as exactly represents that state of contraction assumed by our faces when strongly affected by heat. The eye-brows are knit, the cheeks rise, the eye-lids are contracted, and the mouth distorted; and this state of contraction to which the features of the negroes are perpetually exposed in the hot climates they inhabit, is become particularly characteristic. Excessive cold and snow produces the same effect; and hence

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this kind of countenance is also common among the Tartars; while, in the temperate climates, the features are proportionably lengthened, and the whole countenance expanded.

The Copts profess the Christian religion, but follow the heresy of the Eutychiens, whence they have been persecuted by the Greeks; but having at last got the better of their adversaries, they are become the depositaries of the registers of the lands and tribes. At Cairo they are called *writers*; and are the intendants, secretaries, and collectors for government. The head of their class is writer to the principal chief; but they are all hated by the Turks to whom they are slaves, as well as by the peasants whom they oppress. Their language bears a great resemblance to the Greek; but they have five letters in their alphabet, as well as a number of words in their language, which may be considered as the remains of the ancient Egyptian. These are found to bear a near resemblance to the dialects of some of the neighbouring nations, as the Arabic, Ethiopian, Syriac, &c. and even of those who lived on the banks of the Euphrates. The language of the Copts, however, has fallen into disuse for upwards of 300 years. On the conquest of the country by the Saracens, the latter obliged the people to learn their language; and about the year 722 the use of the Greek tongue was prohibited throughout the whole of their empire: the Arabic language then of course became universal; while the others, being only met with in books, soon became totally neglected. The true Coptic, therefore, though there is a translation of the scriptures and many books of devotion written in it, is understood by nobody, not even the monks and priests.

III. The *Turks*, who have the title of being masters of Egypt, but are chiefly to be met with at Cairo, where they possess the religious and military employments. Formerly they possessed also the posts under government; but these are now occupied by the fourth race of inhabitants, viz.

IV. The *Mamlouks*. Of the origin of these we have already given some account: we have only, therefore, to relate some of the most remarkable particulars concerning their constitution and government, manners, &c.

These people, as has already been mentioned, are the real masters of Egypt; and in order to secure themselves in the possession of the country, they have taken several precautions. One of the principal of these is the degradation of the two military corps of azabs and janizaries, both of which were formerly very formidable. They have been able to effect this only in consequence of the corrupt and wretched government of the Turks; for before the revolt of Ibrahim Kiaya, the Turkish troops, which ought to have consisted of 40,000, were reduced to less than half that number through the avarice and malversation of their officers. Their degradation was completed by Ali Bey; who having first displaced all the officers who gave him any umbrage, left their places vacant, and so reduced the consequence of the whole, that the azabs and janizaries are now only a rabble of vagabonds, who dread the Mamlouks as much as the meanest of the populace. The principal body of the Mamlouks reside at Cairo; but many of them are dispersed through the country, in order to keep up their authority, collect the tribute, and oppress the people: yet it should seem very easy

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for the Porte to dispossess them of this usurped authority, as their number is supposed not to exceed 8500, including among these a great many youth under 20 years of age.

The Mamlouks are all horsemen; and as war is accounted the only honourable employment among them, it is reckoned disgraceful to walk on foot, none but cavalry being accounted soldiers. The other inhabitants are allowed only the use of mules and asses; and the same mark of indignity is imposed upon Europeans; though, by proper management and liberal presents, this may be got over. In the year 1776 lord Algernoun Percy afterwards lord Louvaine, and the earl of Charlemont, obtained permission to ride upon horseback. The Mamlouks, however, are not incited to this continual appearance on horseback merely by their supposed superiority to the rest of the inhabitants; it is rendered necessary by their dress, which is extremely unwieldy and cumbersome. It consists of a wide ¹⁵³Aburd shirt of thin yellowish-coloured cotton; over which is a gown of Indian linen, or some of the light stuffs of Damascus or Aleppo. Over this is a second covering of the same form and wideness, with sleeves reaching down to the ends of the fingers. The former covering is called *antari*, and the latter *caflan*. The caflan is usually made of silk or some finer stuff than the under garments; and both of them are fastened by a long belt, which divides the whole dress into two bundles. Over all these they have a third, named *djouha*, consisting of cloth without lining, and made nearly similar to the others, but that the sleeves are cut in the elbow. This coat is lined, sometimes even in summer, with fur; and as if all this was not sufficient, they have an outer covering called the *beniche*, which is the cloak or robe of ceremony; and so completely covers the body, that even the ends of the fingers are not to be seen. Thus, when the beniche and other accoutrements are on, the whole body appears like a long sack, with a bare neck and bald head covered with a turban thrust out of it. This turban is called a *kaouk*; and is of a cylindrical form, yellow, and turned up on the outside with a roll of muslin artificially folded up. On their feet they have a sock of yellow leather reaching up to the heels, slippers without any quarters, which consequently are always ready to be left behind in walking. Lastly, to complete this extraordinary dress, they have a kind of pantalon or trowsers, long enough to reach up to the chin, and so large that each of the legs is big enough to contain the whole body; but that they may walk more at their ease under such a number of impediments, they tie all the loose parts of their dress with a running fash.

“ Thus swaddled (says M. Volney), we may imagine the Mamlouks are not very active walkers; and those who are not acquainted by experience with the prejudices of different countries, will find it scarcely possible to believe that they look on this dress as exceedingly commodious. In vain we may object that it hinders them from walking, and encumbers them unnecessarily on horseback; and that in battle a horseman once dismounted is a lost man. They reply, *It is the custom*, and every objection is answered.”

In the accoutrements of their horses, the Mamlouks are almost equally absurd. The saddle is a clumsy piece of furniture, weighing with the saddle-cloths not less

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than 25 pounds; while the weight of the stirrups is never less than 9 or 10 pounds, nay, frequently exceeds 13. On the back-part of the saddle rises a truss-femur about eight inches in height, with a pommel before projects four or five inches, in such a manner as to endanger the break of the horseman if he should happen to stoop. Instead of a stuffed frame, they have three thick woollen coverings below the saddle; the whole being fastened by a surcingle, which, instead of a buckle, is tied with leather thongs in very complicated knots, and liable to slip. Instead of a crupper they have a large martingale which throws them upon the horse's shoulders. The stirrups are made of copper, longer and wider than the foot, having circular edges an inch high in the middle, and gradually declining toward each end. The edges are sharp, and used instead of spurs, by which means the poor animal's sides are much wounded. The weight of the furniture has already been mentioned; and is the more ridiculous as the Egyptian horses are very small. The bridle is equally ill contrived, and greatly injures the horse's mouth, especially by reason of the violent method they have of managing the animal. Their usual way is to put the horse to a full gallop, and suddenly stop him when at full speed. Thus checked by the bit, he bends in his hind legs, stiffens the fore ones, and moves along as if he scarce had joints in his body: yet, notwithstanding all those disadvantages, our author acknowledges that they are vigorous horsemen, having a martial appearance which pleases even strangers.

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Their arms,
education,
&c.

In the choice of their arms they have shown themselves more judicious. Their principal weapon is an English carbine about 30 inches long; but so large in the bore, that it can discharge 10 or 12 balls at a time, which can scarce fail of doing great execution even from the most unskilful hand. Besides two large pistols carried in the belt, they have sometimes a heavy mace at the bow of the saddle for knocking down their enemy; and by the shoulder-belt they suspend a crooked sabre measuring 24 inches in a straight line from the hilt to the point, but 30 at least in the curve. The reason of the preference given to the crooked blade is, that the effect of a straight one depends merely on the force with which it falls, and is confined to a small space, but that of a crooked one is continued longer by the action of the arm in retiring. The Mamlouks commonly procure their sabres from Constantinople, or other parts of Europe; but the boys rival each other in those of Persia and such as are fabricated of the ancient steel of Damascus. For these they frequently pay as high as 40 l. or 50 l. sterling; but though it must be allowed that the edge of these weapons is exquisitely keen, yet they have the defect of being almost as brittle as glass. The whole education and employment of the Mamlouks consists in the exercise of these weapons, or what is conducive to it; so that we should imagine they might at last become altogether irresistible. Every morning the greater part of them exercise themselves in a plain near Cairo, by firing their carbines and pistols in the most expeditious manner, having an earthen vessel for a mark to shoot at; and the person who breaks it is highly applauded by the boys who attend in order to encourage them. Here also they exercise themselves in the use of the sabre, as well as of the bow and arrows; though they do not any

longer make use of these last in their engagements. Their favourite diversion is throwing the *djerid*; a word properly signifying a reed, but which is generally made use of to signify any staff thrown by the hand after the manner of the Roman pilum. In this exercise they make use of the branches of the palm-tree fresh stripped. These branches, which have the form of the stalk of an artichoke, are about four feet long, and weigh five or six pounds. With these the cavaliers enter the lists, riding full speed, and throwing them afterwards at each other from a considerable distance. As soon as the assailant has thrown his weapon, he turns his horse, and his antagonist pursues in his turn. The diversion, however, frequently turns out very serious, as some are capable of throwing these weapons with force sufficient to wound their antagonists mortally. Ali Bey was particularly dexterous at this kind of sport, and frequently killed those who opposed him. All these military exercises, however, are by no means sufficient to render the Mamlouks formidable in the field. In their engagements they have neither order, discipline, nor even subordination; so that their wars are only scenes of robbery, plunder, and tumultuary encounters, which begin very often suddenly in the streets of Cairo without the least warning. If the contention happens to be transferred to the country, it is still carried on in the same manner. The strongest or most daring party pursues the other. If they are equal in courage, they will perhaps appoint a field of battle, and that without the least regard to advantages of situation, but fighting in platoons, with the boldest champions at the head of each. After mutual despatches the attack begins, and every one chooses out his man. After discharging their fire-arms, if they have an opportunity they attack with their sabres; and such as happen to be dismounted are helped up again by their servants; but if nobody happens to be near, the servants will frequently kill them for the sake of the money they carry about them. Of late, however, the ordinary Mamlouks, who are all slaves to the reil, seem convinced that their patrons are the persons principally interested; for which reason they reasonably enough conclude that they ought to encounter the greatest dangers. Hence they generally leave them to carry on the dispute by themselves; and being always sure of finding a matter who will employ them, they generally return quietly to Cairo until some new revolution takes place.

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Are not
formidable
in war.

The mode of living among the Mamlouks is exceedingly expensive, as may easily be conceived from what has already been related. There is not one of them who does not cost above 100 l. sterling annually, and many of them upwards of 200 l. At every return of the fast of Ramadan, their masters must give them a new suit of French and Venetian cloths, with stuffs from India and Damascus. Frequently they require new horses and harness: they must likewise have pistols and sabres from Damascus, with gilt stirrups, and saddles and bridles plated with silver. The chiefs are distinguished from the vulgar by the trinkets and precious stones they wear; by riding Arabian horses of 200 l. or 300 l. value, wearing shawls of Cashmere in value from 25 l. to 50 l. each, with a variety of pelisses, the cheapest of which costs above 20 l. Even the European merchants have given into this kind of extravagance;

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Their ex-
pense of
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vagance; so that not one of them looks upon his wardrobe to be decently furnished unless it be in value 500 l. or 600 l.

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Their bad
character.

Anciently it was customary for the women to adorn their heads with sequins; but this is now rejected as not sufficiently expensive. Instead of these, diamonds, emeralds, and rubies, are now substituted; and to these they add French stuffs and laces. In other respects the character of the Mamlouks is almost the worst that can be imagined. Without affection, tie, or connection with each other or with the rest of mankind, they give themselves up without control to the most enormous vices; and, according to M Volney, they are at once ferocious, peridious, seditious, base, deceitful, and corrupted by every species of debauchery, not excepting even the unnatural vice; of which he tells us not one is free, this being the very first lesson each of them receives from his master, all being originally slaves, as has already been mentioned.

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Miserable
state of the
Egyptians.

As these are the present governors of Egypt, we may easily judge that the condition of the common people cannot be very agreeable. The greater part of the lands indeed are in the hands of the Mamlouks, beys, and professors of the law, the property of all others being very precarious. Contributions are to be paid, or damages repaired, every moment; and there is neither right of succession nor inheritance for real property, but every thing must be purchased from government. The peasants are allowed nothing but what is barely sufficient to sustain life. They cultivate rice and corn indeed, but are not at liberty to use either. The only food allowed them is dora or Indian millet, from which they make a kind of tasteless bread; and of this, with water and raw onions, consists all their fare throughout the year. They esteem themselves happy, therefore, if along with these they can sometimes procure a little honey, cheese, four milk, or a few dates. They are very fond of flesh meat and fat; neither of which, however, they have an opportunity of tasting except at extraordinary festivals. Their ordinary dress consists of a shirt of coarse blue linen, and a clumsy black cloak; with a sort of black bonnet over their heads; and over all they wear a long red woollen handkerchief. Their arms, legs, and breasts, are naked, and most of them do not even wear drawers. They live in mud-walled huts of the most miserable construction, where they are exposed to the inconveniences of smoke, heat, and unwholesome air; to all which are to be added the continual fears they live in of being robbed by the Arabs, oppressed by the Mamlouks, or some other grievous calamity. The only conversation is concerning the intestine troubles and misery of the country, murders, ballinades, and executions. Here sentence of death is executed without the least delay or form of trial. The officers who go the rounds in the streets either by night or day, are attended by executioners, who carry along with them leathern bags for receiving the heads they cut off in these expeditions. Even the appearance of guilt is not necessary to infer a capital punishment; for frequently nothing more is requisite than the possession of wealth, or being supposed to possess it. In this case the unfortunate person is summoned before some bey; and when he makes his appearance, a sum of money is demanded of him. If he denies that he possesses it, he is thrown on his back, and receives two or three

hundred blows on the soles of his feet, nay perhaps is put to death without any ceremony. The only security of those who possess any wealth in this country therefore is, to preserve as great an appearance of poverty as possible.

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Diseases
which seem to be prevalent
in this
country.

Though the climate of Egypt is far from being unhealthy; yet there are not a few diseases which seem to be peculiar to it, and to have their origin either from the constitution of the atmosphere, or the manner of living of the inhabitants. One of these till lately has been supposed to be the plague; which opinion we find supported by Dr Mead, who has endeavoured to assign a natural reason why it should take its origin in this country. But it is now universally agreed, that the plague never originates in the interior parts of Egypt, but always begins at Alexandria, passing successively from thence to Rosetta, Cairo, Damietta, and the rest of the Delta. It is likewise observed, that its appearance is always preceded by the arrival of some vessel from Smyrna or Constantinople; and that, if the plague has been very violent in either of these cities, the danger to Egypt is the greater. On proper inquiry, it is found to be really a native of Constantinople; from whence it is exported by the absurd negligence of the Turks, who refuse to take any care to prevent the spreading of the infection. As they fell even the clothes of the dead without the least ceremony, and ships laden with this pernicious commodity are sent to Alexandria, it is no wonder that it should soon make its appearance there. As soon as it has reached Cairo, the European merchants shut themselves up with their families in their khans or lodgings, taking care to have no further communication with the city. Their provisions are now deposited at the gate of the khan, and are taken up by the porter with iron tongs; who plunges them into a barrel of water provided for the purpose. If they have occasion to speak to any person, they take care to keep at such a distance as to avoid touching or even breathing upon each other. By these precautions they certainly escape the general calamity, except by accident; and it not long ago happened that the disease was conveyed by a cat into the dwellings of the French merchants in Cairo; by which two were infected, and one died. In this manner they are imprisoned for three or four months, without any other amusement than walking on their terraces in the evenings, cards, or conversation with one another. There is a remarkable difference betwixt the plague at Constantinople and in Egypt. In the former, it is most violent in summer; and in the latter in winter, ending there always in the month of June. It is also remarkable, that the water-carriers of Egypt, whose backs are constantly wet from the nature of their occupation, never have the plague. It appears in Egypt every fourth or fifth year, when it makes such ravages as would depopulate the country, were it not for the vast concourse of strangers which arrive here every year from all parts of the Turkish empire.

A malady which seems in reality to be peculiar to Egypt is blindness. This is so common at Cairo, as M. Volney informs us, that out of 100 people whom he has met on the street, he might reckon 20 quite blind; 10 without the sight of one eye; and 20 others with their eyes red, purulent, or bleimished. Almost every one, says he, wears a fillet, a token of

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an approaching or convalescent ophthalmia. In considering the causes of this disorder, he reckons the sleeping upon terraces to be a principal one. The fourth wind, he says, cannot be the cause; otherwise the Bedouins would be equally subject to it with the Egyptians themselves: but what is with the greatest probability to be assigned as the cause, according to our author, is the very poor and little nutritive food which the natives are obliged to use. "The cheese, sour-milk, honey, confection of grapes, green fruits, and raw vegetables (says he), which are the ordinary food of the people, produce in the stomach a disorder which physicians have observed to affect the sight; the raw onions, especially, which they devour in great quantities, have a peculiar heating quality, as the monks of Syria made me remark on myself. Bodies thus nourished, abound in corrupted humours, which are constantly endeavouring a discharge. Diverted from the ordinary channels, by habitual perspiration, these humours fly to the exterior parts, and fix themselves where they find the least resistance. They therefore naturally attack the head, because the Egyptians, by shaving it once a-week, and covering it with a prodigiously hot head-dress, principally attract to it the perspiration; and if the head receives ever so slight an impression of cold on being uncovered, this perspiration is suppressed, and falls upon the teeth, or fill more readily on the eyes as being the tenderest part. It will appear the more probable that the excessive perspiration of the head is a principal cause, when we reflect that the ancient Egyptians, who went bare-headed, are not mentioned by physicians as being so much afflicted with ophthalmies; though we are informed by historians that some of the Pharaohs died blind. The Arabs of the desert also, who cover the head but little, especially when young, are also very little subject to them." In this country blindness is often the consequence of the small-pox, a disorder very frequent and very fatal among the Egyptians; and no doubt the more dangerous on account of their absurd method of treating it, of which it is needless to enter into any discussion in this place. They are not unacquainted with inoculation; but seem not to be sensible of its advantages, as they very seldom practise it.

To the same cause, viz. unwholesome food, M. Volney ascribes the general deformity of the beggars, and the miserable appearance of the children: which he says are no where so wretched. "Their hollow eyes, pale and puffed faces, swollen bellies, meagre extremities, and yellow skins, make them always seem as if they had not long to live. Their ignorant mothers pretend that this is the effect of the *evil eye* of some envious person, who has bewitched them; and this ancient prejudice is still general in Turkey: but the real cause is the badness of their food. In spite of the talismans, therefore, an incredible number of them perish; nor is any city more fatal to the population of the neighbouring country than Grand Cairo."

The venereal disease, which, for reasons best known to themselves, the inhabitants call the *blest evil*, is so general at Cairo, that one half of the inhabitants are infected. It is extremely difficult to cure, though the symptoms are comparatively very mild, inasmuch that people who are infected with it will frequently live to the age of 80; but it is fatal to children born with the

infection, and exceedingly dangerous to such as emigrate to a colder climate.

Besides these, there are two uncommon diseases met with in Egypt, viz. a cutaneous eruption which returns annually; and a swelling of the testicles, which often degenerates into an enormous hydrocele. The former comes on towards the end of June or beginning of July, making its appearance in red spots and pimples all over the body, occasioning a very troublesome itching. The cause of this distemper, in M. Volney's opinion, is the corruption of the waters of the Nile, which towards the end of April become very putrid, as has already been observed. After this has been drunk for some time, the waters of the inundation, which are fresh and wholesome, tend to introduce some change in the blood and humours; whence a cutaneous eruption is the natural consequence.

The hydrocele most commonly attacks the Greeks and Copts; and is attributed to the quantity of oil they make use of, as well as to their frequent hot-bathing. Our author remarks, that "in Syria as well as in Egypt, constant experience has shown, that brandy distilled from common figs, or from the fruit of the sycamore tree, as well as from dates and the fruit of the nopal, has a most immediate effect on the testicles, which it renders hard and painful the third or fourth day after it has been drunk; and if the use of it be not discontinued, the disorder degenerates into a confirmed hydrocele. Brandy distilled from dried raisins has not the same effect: this is always mixed with aniseeds, and is very strong, being distilled three times. The Christians of Syria and the Copts of Egypt make great use of it; the latter especially drink whole bottles of it at their supper. I imagined this an exaggeration; but I have myself had ocular proofs of its truth, though nothing could equal my astonishment that such excesses do not produce instant death, or at least every symptom of the most inflexible drunkenness."

In the spring season malignant fevers prevail in this country; concerning which our author mentions no remarkable particular, but that eggs are a kind of poison, and that bleeding is very prejudicial. He recommends a vegetable diet, and the bark in very large quantity.

Notwithstanding the oppression which the Egyptians labour under, a very considerable trade is carried on from Cairo. This flourishing state of commerce in the midst of the most desperate barbarity and despotism is owing to three causes. 1. That all the commodities consumed in Egypt are collected within the walls of that city. 2. That the Mamlouks and all the people of property reside in that place, and there spend their whole revenues. 3. By the situation of this city it is a centre of circulation; corresponding with Arabia and India, by the Red Sea; with Abyssinia and the interior parts of Africa, by the Nile; and with Europe and the Turkish empire, by means of the Mediterranean. A caravan comes here annually from Abyssinia, bringing from 1000 to 1200 slaves, with gum, ivory, gold-dust, ostrich-feathers, parrots, and monkeys.—Another, which sets out from the extreme parts of Morocco, takes in pilgrims for Mecca from all that country as far south as the mouth of the river Senegal. It consists of not fewer than three or four thousand camels;

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mels; and, passing along the coasts of the Mediterranean, collect likewise the pilgrims from Algiers, Tripoli, and Tunis, arriving at last at Alexandria by the way of the desert. Proceeding thence to Cairo, it joins the Egyptian caravan; and then setting out both together, they take their journey to Mecca, from whence they return in one hundred days; but the Morocco pilgrims, who have still 600 leagues to go, are upwards of a year in returning. The commodities they bring along with them are, India stuffs, shawls, gums, perfumes, pearls, and principally coffee. Besides the profits of this merchandize, considerable sums arise from the duties paid by pilgrims, and the sums expended by them.

The caravans above mentioned are not the only means by which these commodities are brought to Cairo. They arrive also at Suez, to which port the southerly winds bring in the month of May six or eight and twenty sail of vessels from Jedda. Small caravans likewise arrive from time to time from Damascus with silk and cotton stuffs, oils, and dried fruits. During the proper season there are also a number of vessels in the road of Damietta, unloading hogheads of tobacco from Latakia, vast quantities of which are consumed in this country. For this commodity rice is taken in exchange; while other vessels bring clothing, arms, furs, passengers, and wrought silk from Constantinople. There are other vessels which come from Marseilles, Leghorn, and Venice, with cloths, cochineal, Lyons stuffs and laces, grocery ware, paper, iron, lead, Venetian sequins, and German dahlers. These are conveyed to Rosetta in barks called by M. Volney *djem*, but which seem to be the same mentioned by Mr Bruce under the name of *canja*, and which are particularly described by him. He informs us, that there is a peculiarity in the form of this vessel which makes it useful for navigating the river Nile; and that is, that the keel is not straight, but a portion of a parabola, whose curve is almost insensible to the eye. Hence, as sand-banks are very common in the Nile, and vessels are apt to strike them when the water becomes low, the middle of the *canja* will be aground while the extremities are afloat, and thus by means of oars and other assistance, it is always possible to get clear; but were the keel straight, this would be altogether impossible, by reason of the vast sails those vessels carry, which would urge them on with too much force to be recovered. The accommodation on board those vessels is much better than what could be expected: but they are liable to the depredations of robbers, who either swim under water in the day time, or upon goats skins during the night; though these seldom attack any boats where there are Europeans, whom they dread on account of their skill in fire-arms.

From so many sources we need not wonder that the commerce of Cairo should be in a very flourishing state. In 1783, according to the report of the commissioner-general of the customs, it amounted to no less than 6,250,000 l. but notwithstanding this show of wealth, the trade carried on at Cairo contributes very little to the enriching of the people. This will readily appear, when we consider, that great part of the coffee and other merchandize brought from India is exported to foreign countries, the value being paid in goods from Turkey and other European countries; while the country consumption consists entirely, or mostly, in

articles of luxury already finished, and the produce given in return is mostly in raw materials.

Schemes have frequently been projected of enlarging the commerce of Egypt by cutting through the Isthmus of Suez, and thus joining the Mediterranean and Red Seas by a canal. This is looked upon by M. Volney as impracticable. He owns, indeed, that no objection can arise from the distance, which is not more than 18 or 19 leagues; neither does any obstacle arise from mountains, or the inequality of levels, the whole being a sandy barren plain. The difficulty, which he considers as insuperable, proceeds from the nature of the corresponding coasts of the Mediterranean and Red Seas; both of which are low and sandy, where the water forms lakes, shoals, and morasses, so that ships cannot come within a considerable distance of either; and it would be scarce possible to cut a permanent canal amidst these shifting sands: not to mention, that the shore is destitute of harbours, which must be entirely the work of art. The country, besides, has not a drop of fresh water; which it would therefore be necessary to bring as far as from the Nile. The best method of effecting this junction therefore is by means of the river itself; and for this the ground is perfectly well calculated. This has been already done by several Egyptian princes, particularly Sesostris; and the canal is said to have been 170 feet wide, and deep enough for large vessels. After the Grecian conquest it was renewed by the Ptolemies, then by Trajan, and lastly by the Arabs. Part of it still remains, running from Cairo to the north-east of the *Berket-el-Hadj*, or Lake of the Pilgrims, where it loses itself. At present the commerce with Suez is only carried on by means of caravans, which set out towards the end of April or beginning of May, or in the months of July and August; waiting the arrival of the vessels, and setting out on their departure. The caravans are very numerous; that with which M. Volney travelled consisting of 5000 or 6000 men and 3000 camels. The country is as desert and barren as possible, without a single tree or the smallest spot of verdure; so that every necessary for those who accompany the caravan must be carried on the backs of the camels, wood and water not excepted.

The custom-houses of Egypt are in the hands of the Chrilians of Syria. Formerly they were managed by Jews; but these were completely ruined by the extortions of Ali Bey in 1769. The Syrian Chrilians came from Damascus somewhat more than 50 years ago; and having by their economy and industry gained possession of the most important branches of commerce, they were at length enabled to farm the custom-houses, which is an office of great consequence. There were at first only three or four families of them; but their number has since increased to more than 500, and they are reckoned very opulent.

From what has already been said concerning the state of the Egyptians, we may naturally conclude, that the arts and all kinds of learning are at a very low ebb among them. Even the most simple of the mechanical professions are still in a state of infancy. The work of their cabinet-makers, gunsmiths, and locksmiths, is extremely clumsy. There are manufactures of gunpowder and sugar; but the quality of both are very indifferent. The only thing in which they can be said to arrive at any degree of perfection is the manufacture

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facture of silk stuffs; though even these are far less highly finished than those of Europe, and likewise bear a much higher price. One very extraordinary art indeed is still extant among the Egyptians, and appears to have existed in that country from the most remote antiquity; and that is a power of enchanting the most deadly serpents in such a manner, that they shall allow themselves to be handled, nay even hurt in the severest manner, without offering to bite the person who injures them. Those who have this art are named *PSYLLI*; to which article we refer for an account of what has been said on the subject by ancient and modern travellers.

For a description of those stupendous and almost indestructible monuments of human grandeur, the pyramids, so often taken notice of and described by travellers; see the article *PYRAMIDS*.

EGYPTIANS, or *GYPSES*. See *GYPSES*.

EHRETIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 41st order, *Asperifolia*. The fruit is a bilocular berry; the seeds solitary and bilocular; the stigma emarginated.

EHRHARTA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants. The calyx is a two-valved, abbreviated, and one-flowered glume; the corolla is a double glume, each two-valved; the exterior one compressed, and scymmer-shaped, transversely wrinkled, and gashed at the base. There are six stamina, three on each side the pistil in a parallel line. The stigma is simple, compressed, four-tufted, and torn at the top.

EHUD, the son of Gera, a Benjamite, a man left-handed, who delivered Israel from the oppression of Eglon king of Moab, under whom they served for 18 years. See *EGLON*. It being customary for the Israelites to send a present or tribute to the king of Moab; in the year of the world 2579, being the last year of their servitude, Ehud was appointed to carry it, who having a design either to free his country from this oppression, or perish in the attempt, had for this purpose provided himself with a dagger which had two edges, and which he had concealed on his right side, (Judges iii. 15, &c.). After he had delivered the present, pretending he had something of great importance to communicate to the king, he obtained a private audience of him; when taking his opportunity, he stabbed him with the poniard to the heart, and so shutting the door after him, had time to make his escape; for as the king was a very corpulent man, his attendants supposed that he was either reposing or easing himself, and therefore forbore to enter his apartment until Ehud was quite gone. As soon as he came to mount Ephraim, he gathered together the Israelites that lay nearest him, acquainted them with what he had done; and then securing the fords of Jordan that none of them might escape, he fell upon the Moabites, and subdued them.

EIA, or *EY*, in our old writers, are used for an island. Hence the names of places ending in *ey*, denotes them to be islands. Thus, Ramsey, the isle of rams; Shepey, the isle of sheep, &c.

EIA is also sometimes used for water; and hence the names of places near waters or lakes terminate in *ey*.

EJ-CULATOR, in anatomy, a name applied to
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two muscles of the penis from their office in the ejection of the seed. See *ANATOMY*, *Table of the Muscles*.

EJECTÆ, called also *ΕΙΕΤÆ* and *ΗΙΕΤÆ*, heretics of the seventh century, who made profession of the monastic life.—From that passage in Exodus, where Moses and the children of Israel are said to have sung a song in praise of the Lord, after they had passed the Red Sea, wherein their enemies had perished; the *ejectæ* concluded, that they must sing and dance to praise God aright; and as Mary the prophetess, sister of Moses and Aaron, took a drum in her hand, on the same occasion, and all the women did the like, to testify their joy, by playing, beating, and dancing; the *ejectæ*, the better to imitate their conduct herein, endeavoured to draw women to them to make profession of the monastic life, and assist in their mirth.

EICK. See *BRUGES*.

EIDER-DUCK. See *ANAS*.

EIDER-Down. See *DOWN*.

EJECTA, a term used by lawyers for a woman disflowered or cast from the virtuous.

EJECTION, in the animal economy, evacuation, or the discharging any thing through some of the excretories, as by stool, vomit, &c.

EJECTION, in Scots law, is the turning out the possessor of any heritable subject by force; and is either *legal* or *illegal*. Legal ejection is where a person having no title to posses, is turned out by the authority of law. Illegal ejection is one person's violently turning another out of possession without lawful authority.

EJECTMENT, in English law, a writ or action which lies for the lessee for years, on his being ejected or put out of his land, before the expiration of his term, either by the lessor or a stranger. It may also be brought by the lessor against the lessee, for rent in arrears, or holding over his term, &c. Ejectment of late years is become an action in the place of many real actions, as writs of right, formedons, &c. which are very difficult, as well as tedious and expensive; and this is now the common action for trial of titles, and recovering of lands, &c. illegally held from the right owner; yet where entry is taken away by disseins, fines, recoveries, disseins, &c. an ejectment shall not be brought; whereby we find that all titles cannot be tried by this action.

The method of proceeding in the action of ejectment is to draw up a declaration, and feign therein a lease for three, five, or seven years, to him that would try the title; and also feign a casual ejector or defendant; and then deliver the declaration to the ejector, who serves a copy of it on the tenant in possession, and gives notice at the bottom for him to appear and defend his title; or that he the feigned defendant will suffer judgment by default, whereby the true tenant will be turned out of possession; to this declaration the tenant is to appear at the beginning of next term by his attorney, and consent to a rule to be made defendant, instead of the casual ejector, and take upon him the defence, in which he must confess lease, judgment, entry, and ouster, and at the trial stand upon the title only: but in case the tenant in possession does not appear, and enter into the said rule in time, after the declaration served, then, on affidavit being made of the service of the declaration, with the notice to appear as aforesaid,

said, the court will order judgment to be entered against the casual ejector by default; and thereupon the tenant in possession, by writ *habere facias possessionem*, is turned out of his possession. On the trial in ejectment, the plaintiff's title is to be set forth from the person last seized in fee of the lands in question, under whom the lessor claims down to the plaintiff, proving the deeds, &c. and the plaintiff shall recover only according to the right which he has at the time of bringing his action. And here, another who hath title to the land, upon a motion made for that purpose, may be defendant in the action with the tenant in possession, to defend his title; for the possession of the lands is primarily in question, and to be recovered, which concerns the tenant, and the title thereto is tried collaterally, which may concern some other.

EKRON, a city and government of the Philistines. It fell by lot to the tribe of Judah, in the first division made by Joshua (xv. 45.); but afterwards it was given to the tribe of Dan (*id.* xix. 43.). It was situated very near the Mediterranean, between Ashdod and Jamnia. Ekron was a powerful city, and it does not appear by history that the Jews were ever sole peaceable possessors of it: the Ekronites were the first who said that it was necessary to send back the ark of the God of Israel, in order to be delivered from those calamities which the presence of it brought upon their country, (1 Sam. v. 10.). The idol Baalzebub was principally adored at Ekron (2 Kings i. 2, &c.)

ELÆAGNUS, OLEASTER, or *Wild Olive*: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 16th order, *Calycifloræ*. There is no corolla; the calyx is campanulate, quadrifid, superior; the fruit is a plum below the campanulate calyx. There are three species: 1. The spinosa, or eastern broad-leaved olive with a large fruit, is a native of the Levant and some parts of Germany. The leaves are about two inches long, and one and a half broad in the middle. They are placed alternate, and of a silver colour: at the footstalk of every leaf there comes out a pretty long sharp thorn, which are alternately longer: the flowers are small, the inside of the empalement is yellow, and they have a strong scent when fully open. 2. The inermis, without thorns, is that kind commonly preferred in the gardens of this country. The leaves are more than three inches long, and half an inch broad, and have a shining appearance like satin. The flowers come out at the footstalks of the leaves, sometimes singly, at other times two, and sometimes three, at the same place. The outside of the empalement is silvery and fluted; the inside of a pale yellow, and having a very strong scent. The flowers appear in July, and are sometimes succeeded by fruit. 3. The latifolia, with oval leaves, is a native of Ceylon, and some other parts of India. In this country it rises with a woody stem to the height of eight or nine feet, dividing into many crooked branches, garnished with oval and silvery leaves, which have several irregular spots of a dark colour on the surface. They are placed alternately on the branches, and continue all the year.

Culture, &c. The two first may be propagated by laying down the young shoots in autumn. They will take root in one year; when they may be cut off from

the old trees, and either transplanted into a nursery for two or three years to be trained up, or into places where they are to remain. The proper time for this is in the beginning of March or early in the autumn. They should be placed where they may be screened from high winds; for they grow very freely, and are apt to be split by the wind if they are too much exposed. The third sort is too tender to endure the open air of this country; and therefore must be kept in a warm stove, except during a short time in the warmest part of summer.

From the flowers of these plants an aromatic and cordial water has been drawn, which is said to have been successfully used in putrid and pestilential fevers. The genus *elæagnus* is not to be confounded with the oleaster or wild olive of Gerard, Parkinson, and Ray. The last is only a particular species of olive, called by Tournefort and Caspar Bauhine, *olea sylvestris*. See OLEA.

ELÆOCARPUS, in botany: A genus of the monogynia order, belonging to the polyandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is pentapetalous and lacerated; the calyx is pentaphyllous; and the fruit is a plum, with a wrinkled kernel.

ELÆOTHESIUM, in antiquity, the anointing room, or place where those who were to wrestle or had bathed anointed themselves. See GYMNASIUM.

ELAIS, in botany; a genus belonging to the natural order of *Palme*. The male calyx is hexaphyllous; the corolla sexfid; the stamina six: The female calyx is hexaphyllous; the corolla hexapetalous; the stigmata three; the fruit a fibrous plum, with a three-valved nut or kernel.

ELAM (anc. geog.), a country frequently mentioned in Scripture, and lying to the south-east of Shinar. In the time of Daniel (viii. 2.), Sufiana seems to have been part of it; and before the captivity, it does not appear that the Jews called Persia by any other name. Elymæ and Elymais are often mentioned by the ancients. Ptolemy, though he makes Elymais a province of Media, yet he places the Elymæ in Sufiana, near the sea-coast. Stephanus takes it to be a part of Assyria; but Pliny and Josephus more properly of Persia, whose inhabitants this latter tells us sprang from the Elamites. The best commentators agree, that the Elamites, who were the ancestors of the Persians, were descended from Elam the son of Shem. It is likewise allowed, that the most ancient among the inspired writers constantly intend Persia, when they speak of Elam and the kingdom of Elam. Thus, not to detain the reader with unnecessary quotations, when the prophet Jeremiah (xlix. 39.), after denouncing many judgments against this country, adds these words, "But it shall come to pass in the latter days, that I will bring again the captivity of Elam, saith the Lord," he is always understood to mean the restoration of the kingdom of the Persians by Cyrus, who subdued the Babylonians, as they before had subdued the Persians.

ELAPHEBOLIA, in Grecian antiquity, a festival in honour of Diana the huntress. In the celebration a cake was made in the form of a deer (*ιλαφός*), and offered to the goddesses. It owed its institution to the following circumstance: When the Phocians had been

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severely beaten by the Theſſalians, they reſolved, by the perſuaſion of one Deiphantus, to raiſe a pile of combuſtible materials, and burn their wives, children, and effects, rather than ſubmit to the enemy. This reſolution was unaniſouſly approved by the women, who deceived Deiphantus a crown for his magnanimity. When every thing was prepared, before they fired the pile, they engaged their enemies, and fought with ſuch deſperate fury, that they totally routed them, and obtained a complete victory. In commemoration of this unexpected ſucceſs, this feſtival was inſtituted to Diana, and obſerved with the greateſt ſolemnity.

ELAPHEBOLIUM, in Grecian antiquity, the ninth month of the Athenian year, anſwering to the latter part of February and beginning of March. It conſiſted of 30 days; and took its name from the feſtival elaphebolia, kept in this month, in honour of Diana the huntreſs, as mentioned in the preceding article.

ELASMIS, in natural hiſtory, a genus of talcs, compoſed of ſmall plates in form of ſpangles; and either ſingle, and not farther ſiſſile; or, if complex, only ſiſſile to a certain degree, and that in ſomewhat thick laminae.—Of theſe talcs there are ſeveral varieties, ſome with large and others with ſmall ſpangles, which differ alſo in colour and other peculiarities.

ELASTIC, in natural philoſophy, an appellation given to all bodies endowed with the property of elaſticity. See ELASTICITY.

ELASTIC Fluids. See AIR, ELECTRICITY, Gas, and ELASTIC Vapours below.

ELASTIC Reſin. See CAOUTCHOUC.

ELASTIC Vapours are ſuch as may, by any external mechanical force, be compreſſed into a ſmaller ſpace than what they originally occupied; reſtoring themſelves, when the preſſure is taken off, to their former ſtate with a force exactly proportioned to that with which they were at firſt compreſſed. Of this kind are all the aerial fluids without exception, and all kinds of fumes raiſed by means of heat whether from ſolid or fluid bodies.

Of theſe, ſome retain their elaſticity only when a conſiderable degree of heat is applied to them or the ſubſtance which produces them; while others remain elaſtic in every degree of cold, either natural or artificial, that has yet been obſerved. Of the former kind are the vapours of water, ſpirit of wine, mercury, ſal ammoniac, and all kinds of ſublimable ſalts; of the latter, thoſe of ſpirit of ſalt, mixtures of vitriolic acid and iron; nitrous acid, and various other metals, and in ſhort the different ſpecies of aerial fluids indifferently.

The elaſtic force with which any one of theſe fluids is endowed has not yet been calculated, as being ultimately greater than any obſtacle we can put in its way. Thus, if we compreſs the atmophpherical air, we ſhall find that for ſome little time it will eaſily yield to the force we apply; but every ſucceeding moment the reſiſtance will become ſtronger, and a greater and greater force muſt be applied in order to compreſs it farther. As the compreſſion goes on, the veſſel containing the air becomes hot; but no power whatever has yet been able to deſtroy the elaſticity of the contained fluid in any degree; for upon removing the preſſure, it is always found to occupy the very ſame ſpace that

it did before. The caſe is the ſame with aqueous ſteam, to which a ſufficient heat is applied to keep it from condenſing into water. This will yield to a certain degree; but every moment the reſiſtance becomes greater, until at laſt it will overcome any obſtacles whatever. An example of the power of this kind of ſteam we have every day in the ſteam engine; and the vapours of other matters, both ſolid and fluid, have frequently maniſeſted themſelves to be endowed with an equal force. Thus the force of the vapours of ſpirit of wine, has occaſioned terrible accidents when the worm has been ſtopped, and the head of the ſtill abſurdly tied down to prevent an exploſion; the vapours of mercury have burſt in iron box; and thoſe of ſal ammoniac, volatile ſalts, nitrous acid, marine acid, phoſphorus, &c. have all been known to burſt the chemical veſſels which confined them with great force, in ſuch a manner as to endanger thoſe who ſtood near them. In ſhort, from innumerable obſervations, it may be laid down as an undoubted fact; that there is no ſubſtance whatever capable of being reduced into a ſtate of vapour, but what in that ſtate is endowed with an elaſtic force ultimately ſuperior to any obſtacle we can throw in its way.

It hath been a kind of deſideratum among philoſophers to give a ſatisſactory reaſon for this aſtoniſhing power of elaſticity in vapour, ſeemingly ſo little capable of accompliſhing any great purpoſe when in an unconfined ſtate. As air is that fluid in which, from the many experiments made upon it by the air-pump and otherwiſe, the elaſtic property has moſt frequently been obſerved, the reſearches of philoſophers were at firſt principally directed towards it. The cauſes they aſſigned, however, were very inadequate; being founded upon an hypotheſis concerning the form of the particles of the atmophere itſelf, which they ſuppoſed to be either rolled up like the ſprings of watches, or that they conſiſted of a kind of elaſtic flakes. This was followed by another hypotheſis concerning their ſubſtance, which was imagined to be perfectly elaſtic, and ſo ſtrong that they could not be broken by any mechanical power whatever; and thus they thought the phenomenon of the elaſticity of the air might be explained. But an inſuperable difficulty ſtill attended their ſcheme, notwithstanding both theſe ſuppoſitions; for it was obſerved, that the elaſtic power of the air was augmented not only in proportion to the quantity of preſſure it was made to endure, but in proportion to the degree of heat applied to it at the time. Sir Iſaac Newton was aware of this difficulty; and juſtly concluded, that the phenomena of the air's elaſticity could not be ſolved on any other ſuppoſition but that of a repulſive power diſſuſed all around each of its particles, which became ſtronger as they approached, and weaker as they removed from each other. Hence the common phenomena of the air-pump and condenſing-engine received a ſatisſactory explanation; but ſtill it remained to account for the power ſhown in the preſent caſe by heat, as it could not be denied that this element had a very great ſhare in augmenting the elaſticity of the atmophere, and ſeemed to be the only cauſe of elaſticity in other vapours. It does not appear that Sir Iſaac entered into this queſtion, but contented himſelf with attributing to heat the property of

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Elasticity.

increasing repulsion, and ascribing this to another unexplored property called *rarefaction*. Thus matters stood till the great discovery made by Dr Black, that some bodies have the power of absorbing in an unknown manner the element in question, and parting with it afterwards, so that it flows out of the body which had absorbed it with the very same properties that it had before absorption. Hence many phenomena of heat, vapour, and evaporation, were explained in a manner much more satisfactory than had ever been attempted or even expected before. One of these was that remarkable property of metals becoming hot by hammering; during which operation, in the Doctor's opinion, the element of heat is squeezed out from between the particles of the metal as water is from the pores of a sponge by pressing it between the fingers. Of the same nature is the phenomenon above mentioned, that air when violently compressed becomes hot, by reason of the quantity of more subtle element squeezed out from among the particles. In this manner it appears that heat and the repulsive power of Sir Isaac Newton are the very same; that by diminishing the heat of any quantity of air, its elasticity is effectually diminished, and it will of itself shrink into a smaller space as effectually as by mechanical pressure. In one case we have what may be called ocular demonstration of the truth of this doctrine, viz. that by throwing the focus of a strong burning lens upon a small quantity of charcoal *in vacuo*, the whole will be converted into inflammable air, having even a greater power of elasticity than common air in an equal degree of heat. Here there is nothing else but heat or light to produce the elastic power, or cause the particles of charcoal which before *attracted* now to repel each other. In another case we have evidence equally strong, that the element of heat by itself, without the presence of that of light, is capable of producing the same effect. Thus when a phial of ether is put into the receiver of an air-pump, and surrounded by a small vessel of water, the ether boils violently, and is dissipated in vapour, while the water freezes, and is cooled to a great degree. The dissipation of this vapour shows that it has an elastic force; and the absorption of the heat from the water shows, that this element not only *produces* the elasticity, but actually enters into the substance of the vapour itself; so that we have not the least reason to conclude that there is any other repulsive power by which the particles are kept at a distance from one another than the substance of the heat itself. In what manner it acts, we cannot pretend exactly to explain, without making hypotheses concerning the form of the minute particles of matter, which must always be very uncertain. All known phenomena, however, concur in rendering the theory just now laid down extremely probable. The elasticity of the steam of water is exactly proportioned to the degree of heat which flows into it from without; and if this be kept up to a sufficient degree, there is no mechanical pressure which can reduce it into the state of water. This, however, may very easily be done by abstracting a certain portion of the latent heat it contains; when the elastic vapour will become a dense and heavy fluid. The same thing may be done in various ways with the permanently elastic fluids. Thus the purest dephlogisticated air, when made to part with its latent heat

by burning with iron, is converted into a gravitating substance of an unknown nature, which adheres strongly to the metal. If the decomposition is performed by means of inflammable air, both together unite into an heavy, aqueous, or acid fluid: if by mixture with nitrous air, still the heat is discernible, though less violent than in the two former cases. The decomposition indeed is slower, but equally complete, and the dephlogisticated air becomes part of the nitrous acid, from which it may be again expelled by proper means; but of these means heat must always be one; for thus only the elasticity can be restored, and the air be recovered in its proper state. The same thing takes place in fixed air, and all other permanently elastic fluids capable of being absorbed by others. The conclusion therefore which we can only draw from what data we have concerning the composition of elastic vapours is, that all of them are formed of a terrestrial substance, united with the element of heat in such a manner that part of the latter may be squeezed out from among the terrestrial particles; but in such a manner, that as soon as the pressure is taken off, the surrounding fluid rushes in, and expands them to their original bulk: and this expansion or tendency to it will be increased in proportion to the degree of heat, just as the expansion of a sponge would be exceedingly augmented, if we could contrive to convey a stream of water into the heart of it, and make the liquid flow out with violence through every pore in the circumference. In this case, it is evident that the water would act as a *power of repulsion* among the particles of the sponge, as well as the fire does among the particles of the water, charcoal, or whatever other substance is employed. Thus far we may reason from analogy; but in all probability the internal and essential texture of these vapours will for ever remain unknown. Their obvious properties, as well as some of their more latent operations in many cases, are treated of under a variety of articles in this work, as AEROLOGY, EVAPORATION, VOLCANO, &c.

It has been imagined by some, that the artificial elastic fluids have not the same mechanical property with common air, viz. that of occupying a space inversely proportional to the weights with which they are pressed: but this is found to be a mistake. All of them likewise have been found to be non-conductors of electricity, though probably not all in the same degree. Even aqueous vapour, when intimately mingled with any permanently elastic fluid, refuses to conduct this fluid, as is evident from the highly electrical state of the atmosphere in very dry weather, when we are certain that aqueous vapour must abound very much, and be intimately mixed with it. The colour of the electric spark, though it may be made visible in all kinds of permanently elastic vapours, is very different in different fluids. Thus in inflammable and alkaline air it is red or purple, but in fixed air it appears white.

ELASTICITY, or ELASTIC Force, that property of bodies wherewith they restore themselves to their former figure, after any external pressure.

The cause or principle of this important property of elasticity, or springiness, is variously assigned. The Cartesians account for it from the materia subtilis making an effort to pass through pores that are too narrow

Elasticity

row for it. Thus, say they, in bending, or compressing, a hard elastic body, *e. gr.* a bow, its parts recede from each other on the convex side, and approach on the concave: consequently the pores are contracted or straitened on the concave side; and if they were before round, are now, for instance, oval: so that the materia subtilis, or matter of the second element, endeavouring to pass out of those pores thus straitened, must make an effort, at the same time, to restore the body to the state it was in when the pores were more patent and round, *i. e.* before the bow was bent: and in this consists its elasticity.

Other later and more wary philosophers account for elasticity much after the same manner as the Cartesians; with this only difference, that in lieu of the subtle matter of the Cartesians, these substitute ETHER, or a fine ethereal medium that pervades all bodies.

Others, setting aside the precarious notion of a materia subtilis, account for elasticity from the great law of nature ATTRACTION, or the cause of the COHESION of the parts of solid and firm bodies. Thus, say they, when a hard body is struck or bent, so that the component parts are moved a little from each other, but not quite disjointed or broke off, or separated so far as to be out of the power of that attracting force whereby they cohere; they must certainly, on the cessation of the external violence, spring back to their former natural state.

Others resolve elasticity into the pressure of the atmosphere: for a violent tension, or compression, tho' not so great as to separate the constituent particles of bodies far enough to let in any foreign matter, must yet occasion many little vacuola between the separated surfaces; so that upon the removal of the force they will close again by the pressure of the aerial fluid upon the external parts. See ATMOSPHERE.

Lastly, others attribute the elasticity of all hard bodies to the power of resiliency in the air included within them: and so make the elastic force of the air the principle of elasticity in all other bodies.

The *ELASTICITY of Fluids* is accounted for from their particles being all endowed with a centrifugal force; when Sir Isaac Newton, prop. 23. lib. 2. demonstrates, that particles, which naturally avoid or fly off from one another by such forces as are reciprocally proportioned to the distances of their centre, will compose an elastic fluid, whose density shall be proportional to its compression; and *vice versa*, if any fluid be composed of particles that fly off and avoid one another, and hath its density proportional to its compression, then the centrifugal forces of those particles will be reciprocally as the distances of their centres.

ELASTICITY of the Air, is the force wherewith that element dilates itself, upon removing the force whereby it was before compressed. See AIR, and ATMOSPHERE.

The elasticity or spring of the air was first discovered by Galileo. Its existence is proved by this experiment of that philosopher: An extraordinary quantity of air being intruded by means of a syringe into a glass or metal ball, till such time as the ball, with this accession of air, weigh considerably more in the balance than it did before; upon opening the mouth

thereof, the air rushes out, till the ball sink to its former weight. From hence we argue, that there is just as much air gone out, as compressed air had been crowded in. Air, therefore, returns to its former degree of expansion, upon removing the force that compressed or resisted its expansion; consequently it is endowed with an elastic force. It must be added, that as the air is found to rush out in every situation or direction of the orifice, the elastic force acts every way, or in every direction.

The elasticity of the air makes a considerable article in PNEUMATICS.

The cause of the elasticity of the atmosphere hath been commonly ascribed to a repulsion between its particles; but this can give us only a very slight idea of the nature of its elasticity. The term *repulsion*, like that of *attraction*, requires to be defined; and in all probability will be found in most cases to be the effect of the action of some other fluid. Thus, we find, that the elasticity of the atmosphere is very considerably affected by heat. Supposing a quantity of air heated to such a degree as is sufficient to raise Fahrenheit's thermometer to 212, it will then occupy a considerable space. If it is cooled to such a degree as to sink the thermometer to 0, it will shrink up into less than half the former bulk. The quantity of repulsive power therefore acquired by the air, while passing from one of these states to the other, is evidently owing to the heat added to or taken away from it. Nor have we any reason to suppose, that the quantity of elasticity or repulsive power it still possesses is owing to any other thing than the fire contained in it. The supposing repulsion to be a primary cause independent of all others, hath given rise to many erroneous theories, and been one very great mean of embarrassing philosophers in their accounting for the phenomena of ELECTRICITY.

ELATE, in botany, a genus belonging to the natural order of *Palme*. There is no male calyx; the corolla is tripetalous, with three stamina. There is no female calyx; the corolla is tripetalous, with one pistil; the fruit is an oval acuminate plum. Plate CLXXXIX

ELATER, in zoology; a genus of insects, belonging to the order of coleoptera. The antennæ are setaceous; and an elastic spring or spine projects from the hinder extremity of the breast or under side of the thorax. By means of this kind of spring, the animal, when turned upon his back, contrives to leap up into the air, and so turn itself. It varies in size; and when the insect is young and newly metamorphosed, its elytra are of a beautiful deep red; but in a few days they change to a much darker hue, and are nearly of a chestnut colour. In the state of larvæ it inhabits the trunks of decayed trees, and is there transformed. With the help of its wings it issues from its prison, flutters upon flowers, wanders over the fields, and conceals itself in thickets or under the bark of trees.

ELATERIUM, in botany: A genus of the monandria order, belonging to the monoclea class of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. There is no male calyx; the corolla is salver-shaped; there is no female calyx; the corolla salver-shaped; the capsule inferior, unilocular, and bivalved.

ELATERIUM, *EARTRIPPIUM*, in pharmacy, a violently purgative

Elasticity
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Elasticum.

Elath
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gative medicine, prepared from the wild cucumber.

ELATH, or ELOTH, a part of Idumæa, situated upon the Red Sea, which David in his conquest of Edom took (2 Sam. viii. 14.), and there established a trade to all parts of the world. His son, we see, built ships in Elath, and sent them from thence to Ophir for gold, 2 Chr. viii. 17, 18. It continued in the possession of the Israelites about 150 years, till in the time of Joram, the Edomites recovered it (2 Kings viii. 20.); but it was again taken from them by Azariah, and by him left to his son, 2 Kings xiv. 22. His grandson Ahaz, however, lost it again to the king of Syria (ib. xvi. 6.); and the Syrians had it in their hands a long while, till after many changes under the Ptolemies, it came at length into the possession of the Romans.

ELATINE, in botany: A genus of the tetragynia order, belonging to the octandria class of plants; and in the natural method ranking under the 15th order, *Inundate*. The calyx is tetraphyllous; the petals four; the capsule quadrilocular, quadrivalved, and deffeped.

ELATOSTEMA, in botany: A genus of the pentandria order, belonging to the monœcia class of plants. The male flowers have no calyx; the corolla is quinquepartite; the stamina are five filaments. There are female flowers on the same plant; these have no calyx nor corolla; the pericarpium is a very small oblong, bivalve, monispermous capsule; the seeds single and egg-shaped.

ELBE, a large river in Germany, which, rising on the confines of Silesia, runs through Bohemia, Saxony, and Brandenburg; and afterwards dividing the duchy of Luxemburg from that of Mecklenburg, as also the duchy of Bremen from Holstein, it falls into the German ocean, about 70 miles below Hamburg. It is navigable for great ships higher than any river in Europe.

ELBING, a city of Polish Prussia, in the palatinate of Marienburg, situated in E. Long. 20. 0 N. Lat. 54. 15, on a bay of the Baltic sea, called the *Frische*, near the mouth of the Viistula. The town is large, populous, and very well built. It is divided into two parts, called the old and new town, which are both of them very well fortified. The old town has a handsome tower, with a good college. The stadt-house and the academy are good buildings, with pleasant gardens, which are worth seeing. The place has a considerable trade, especially in sturgeon, mead, cheese, butter, and corn. It is seated in a champaign level like Holland, very fruitful and populous. The inhabitants are partly Lutherans and partly Roman Catholics. The Boors in the neighbourhood have as good houses and apparel almost as the nobility of Courland.

ELBOW, the outer angle made by the flexure or bend of the arm. That eminence whereon the arm rests, called by us *elbow*, is by the Latins called *cubitus*, and the Greeks *αγκυον*, and by others *αγκυρον*.

Elbow is also used by architects, masons, &c. for an obtuse angle of a wall, building, or road, which diverts it from its right line.

ELCESAITES, in church-history, ancient heretics, who made their appearance in the reign of the emperor Trajan, and took their name from their leader

Elcefaï. The Elcefaïtes kept a mean between the Jews, Christians, and Pagans; they worshipped but one God, observed the Jewish sabbath, circumcision, and the other ceremonies of the law. They rejected the Pentateuch, and the prophets; nor had they any more respect for the writings of the apostles, particularly those of St Paul.

ELDERS, or SENIORS, in Jewish history, were persons the most considerable for age, experience, and wisdom. Of this sort were the 70 men whom Moses associated to himself in the government of his people; such, likewise, afterwards were those who held the first mark in the synagogue, as presidents.

In the first assemblies of the primitive Christians, those who held the first place were called *elders*. The word *presbyter*, often used in the New Testament, is of the same signification: hence the first councils of Christians were called *presbyteria*, or *councils of elders*.

ELDERS is also a denomination still retained in the Presbyterian discipline. The elders are officers, who, in conjunction with the pastors, or ministers, and deacons, compose the consistories or kirk-sessions, meeting to consider, inspect, and regulate, matters of religion and discipline. They are chosen from among the people, and are received publicly with some degree of ceremony. In Scotland, there is an indefinite number of elders in each parish; generally about 12. See *Kirk-Sessions*, and *PRESBYTERY*.

ELDER, in botany. See *SAMBUCUS*.

ELEA, or ELIS, (anc. geog.), a district of Peloponnesus, situated between Achaia and Messenia, reaching from Arcadia quite to the west or Ionian sea: so called from ELIS, a cognominal town. See *ELIS*.

ELEATIC PHILOSOPHY, among the ancients; a name given to that of the stoics, because taught at *Elea*, in Latin *Velia*, a town of the Lucani.

The founder of this philosophy, or of the Eleatic sect, is supposed to have been Xenophanes, who lived about the 56th Olympiad, or between 500 or 600 years before Christ. This sect was divided into two parties, which may be denominated *metaphysical* and *physical*; the one rejecting, and the other approving, the appeal to fact and experiment. Of the former kind were Xenophanes, Parmenides, Melissus, and Zeno, of Elea. They are supposed to have maintained principles not very unlike those of Spinoza; they held the eternity and immutability of the world; that whatever existed was only one being; that there was neither any generation nor corruption; that this one being was immovable and immutable, and was the true God; and whatever changes seemed to happen in the universe, they considered as mere appearances and illusions of sense. However, some learned men have supposed, that Xenophanes and his followers, speaking metaphysically, understood by the universe, or the one being, not the material world, but the originating principle of all things, or the true God, whom they expressly affirm to be incorporeal. Thus Simplicius represents them as merely metaphysical writers, who distinguished between things natural and supernatural; and who made the former to be compounded of different principles. Accordingly, Xenophanes maintained, that the earth consisted of air and fire, that all things were produced out of the earth, and the sun and stars out of clouds, and that there were four elements. Parmenides.

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menides also distinguished between the doctrine concerning metaphysical objects, called *truth*, and that concerning physical or corporeal things, called *opinion*; with respect to the former there was one immovable principle, but in the latter two that were moveable, viz. fire and earth, or heat and cold; in which particulars Zeno agreed with him. The other branch of the Eleatic sect were the atomic philosophers, who formed their system from an attention to the phenomena of nature; of these the most considerable were Leucippus, Democritus, and Protagoras.

ELECCAMPANE, in botany. See INULA.

ELECT, (from *eligo*, "I choose") CHOSEN, in the Scriptures, is applied to the primitive Christians; in which sense, the elect are those chosen and admitted to the favour and blessing of Christianity.

ELECT, in some systems of theology, is a term appropriated to the saints, or the predestinated: in which sense the elect are those persons who are said to be predestinated to glory as the end, and to sanctification as the means.

ELECT is likewise applied to archbishops, bishops, and other officers, who are chosen, but not yet consecrated, or actually invested with their office or jurisdiction.

The emperor is said to be elect before he is inaugurated and crowned; a lord-mayor is elect, before his predecessor's mayerality is expired, or the sword is put in his hands.

ELECTION, the choice that is made of any thing or person, whereby it is preferred to some other. There seems this difference, however, between choice and election, that election has usually a regard to a company or community, which makes the choice; whereas choice is seldom used but when a single person makes it.

ELECTION, in British polity, is the people's choice of their representatives in parliament. (See PARLIAMENT.) In this consists the exercise of the democratical part of our constitution: for in a democracy there can be no exercise of sovereignty but by suffrage, which is the declaration of the people's will. In all democracies, therefore, it is of the utmost importance to regulate by whom, and in what manner, the suffrages are to be given. And the Athenians were so justly jealous of this prerogative, that a stranger, who interfered in the assemblies of the people, was punished by their laws with death; because such a man was esteemed guilty of high treason, by usurping those rights of sovereignty to which he had no title. In Britain, where the people do not debate in a collective body, but by representation, the exercise of this sovereignty consists in the choice of representatives. The laws have therefore very strictly guarded against usurpation or abuse of this power, by many salutary provisions; which may be reduced to these three points, 1. The qualifications of the electors. 2. The qualifications of the elected. 3. The proceedings at elections.

(1.) As to the qualifications of the electors. The true reason of requiring any qualification, with regard to property, in voters, is to exclude such persons as are in so mean a situation, that they are esteemed to have no will of their own. If these persons had votes, they would be tempted to dispose of them under some un-

due influence or other. This would give a great, an artful, or a wealthy man, a larger share in elections than is consistent with general liberty. If it were probable that every man would give his vote freely, and without influence of any kind; then, upon the true theory and genuine principles of liberty, every member of the community, however poor, should have a vote in electing those delegates to whose charge is committed the disposal of his property, his liberty, and his life. But since that can hardly be expected in persons of indigent fortunes, or such as are under the immediate dominion of others, all popular states have been obliged to establish certain qualifications; whereby some, who are suspected to have no will of their own, are excluded from voting, in order to set other individuals, whose will may be supposed independent, more thoroughly upon a level with each other.

And this constitution of suffrages is framed upon a wiser principle, with us, than either of the methods of voting, by centuries or by tribes, among the Romans. In the method by centuries, instituted by Servius Tullius, it was principally property, and not numbers, that turned the scale: in the method by tribes, gradually introduced by the tribunes of the people, numbers only were regarded, and property entirely overlooked. Hence the laws passed by the former method had usually too great a tendency to aggrandize the patricians or rich nobles: and those by the latter had too much of a levelling principle. Our constitution steers between the two extremes. Only such are entirely excluded as can have no will of their own: there is hardly a free agent to be found, but what is intitled to a vote in some place or other in the kingdom. Nor is comparative wealth, or property, entirely disregarded in elections; for though the richest man has only one vote at one place, yet, if his property be at all diffused, he has probably a right to vote at more places than one, and therefore has many representatives. This is the spirit of our constitution: not that we assert it is in fact quite so perfect as we have endeavoured to describe it; for if any alteration might be wished or suggested in the present form of parliaments, it should be in favour of a more complete representation of the people.

But to return to the qualifications; and first those of electors for knights of the shire. 1. By statute 8 Hen. VI. c. 7. and 10 Hen. VI. c. 2. (amended by 14 Geo. III. c. 58.) the knights of the shire shall be chosen of people, whereof every man shall have freehold to the value of forty shillings by the year within the county; which (by subsequent statutes) is to be clear of all charges and deductions, except parliamentary and parochial taxes. The knights of shires are the representatives of the landholders, or landed interest of the kingdom: their electors must therefore have estates in lands or tenements within the county represented. These estates must be freehold, that is, for term of life at least; because beneficial leases for long terms of years were not in use at the making of these statutes, and copyholders were then little better than vassals, absolutely dependent upon their lords. This freehold must be of 40 shillings annual value; because that sum would then, with proper industry, furnish all the necessities of life, and render the freeholder, if he pleased, an independent man: For bishop Fleetwood,

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Election. in his *chronicon preciosum*, written at the beginning of the present century, has fully proved 40 shillings in the reign of Henry VI. to have been equal to 12 pounds *per annum* in the reign of Queen Anne; and, as the value of money is very considerably lowered since the bishop wrote, we may fairly conclude, from this and other circumstances, that what was equivalent to 12 pounds in his days, is equivalent to 20 at present. The other less important qualifications of the electors for counties in England and Wales may be collected from the statutes cited below (A); which direct, 2. That no person under 21 years of age shall be capable of voting for any member. This extends to all sorts of members as well for boroughs as counties; as does also the next, *viz.* 3. That no person convicted of perjury, or subornation of perjury, shall be capable of voting in any election. 4. That no person shall vote in right of any freehold, granted to him fraudulently to qualify him to vote. Fraudulent grants are such as contain an agreement to reconvey, or to defeat the estate granted; which agreements are made void, and the estate is absolutely vested in the person to whom it is so granted. And, to guard the better against such frauds, it is farther provided, 5. That every voter shall have been in the actual possession, or receipt of the profits, of his freehold to his own use for 12 kalendar months before; except it came to him by descent, marriage, marriage-settlement, will, or promotion to a benefice or office. 6. That no person shall vote in respect of an annuity or rent-charge, unless registered with the clerk of the peace 12 kalendar months before. 7. That in mortgaged or trust-estates, the person in possession, under the abovementioned restrictions, shall have the vote. 8. That only one person shall be admitted to vote for any one house or tenement, to prevent the splitting of freeholds. 9. That no estate shall qualify a voter, unless the estate has been assessed to some land-tax aid, at least 12 months before the election. 10. That no tenant by copy of court-roll shall be permitted to vote as a freeholder. Thus much for the electors in counties.

As for the electors of citizens and burgesses, these are supposed to be the mercantile part or trading interest of this kingdom. But as trade is of a fluctuating nature, and seldom long fixed in a place, it was formerly left to the crown to summon, *pro re nata*, the most flourishing towns to send representatives to parliament. So that as towns increased in trade, and grew populous, they were admitted to a share in the legislature. But the misfortune is, that the deserted boroughs continued to be summoned, as well as those to whom their trade and inhabitants were transferred; except a few which petitioned to be eased of the expence, then usual, of maintaining their members: four shillings a-day being allowed for a knight of the shire, and two shillings for a citizen or burgess; which was the rate of wages established in the reign of Edward III. Hence the members for boroughs now bear above a quadruple proportion to those for counties; and the number of parliament men is increased since Fortescue's time, in the reign of Henry VI. from 300 to upwards of 500,

exclusive of those for Scotland. The universities were, in general, not empowered to send burgesses to parliament; though once, in 28 Edw. I. when a parliament was summoned to consider of the king's right to Scotland, there were issued writs, which required the university of Oxford to send up four or five, and that of Cambridge two or three, of their most discreet and learned lawyers for that purpose. But it was king James I. who indulged them with the permanent privilege to send constantly two of their own body; to serve for those students who, though useful members of the community, were neither concerned in the landed nor the trading interest; and to protect in the legislature the rights of the republic of letters. The right of election in boroughs is various, depending entirely on the several charters, customs, and constitutions of the respective places; which has occasioned infinite disputes; tho' now, by statute 2 Geo. II. c. 24. the right of voting for the future shall be allowed according to the last determination of the house of commons concerning it; and, by statute 3 Geo. III. c. 15. no freeman of any city or borough (other than such as claim by birth, marriage, or servitude) shall be intitled to vote therein, unless he hath been admitted to his freedom 12 kalendar months before.

(2.) Next, as to the qualifications of persons to be elected members of the house of commons. Some of these depend upon the law and custom of parliaments, declared by the house of commons; others upon certain statutes. And from these it appears, 1. That they must not be aliens born or minors. 2. That they must not be any of the 12 judges, because they sit in the lords' house; nor of the clergy, for they sit in the convocation; nor persons attainted of treason, or felony, for they are unfit to sit any where. 3. That sheriffs of counties, and mayors and bailiffs of boroughs, are not eligible in their respective jurisdictions, as being returning officers; but that sheriffs of one county are eligible to be knights of another. 4. That, in strictness, all members ought to have been inhabitants of the places for which they are chosen; but this, having been long disregarded, was at length entirely repealed by statute 14 Geo. III. c. 58. 5. That no persons concerned in the management of any duties or taxes created since 1692, except the commissioners of the treasury, nor any of the officers following (*viz.* commissioners of prizes, transports, sick and wounded, wine-licences, navy, and victualling; secretaries or receivers of prizes; comptrollers of the army-accounts; agents for regiments; governors of plantations, and their deputies; officers of Minorca or Gibraltar; officers of the excise and customs; clerks or deputies in the several offices of the treasury, exchequer, navy, victualling, admiralty, pay of the army or navy, secretaries of state, salt, stamps, appeals, wine-licences, hackney-coaches, hawkers, and pedlars), nor any persons that hold any new office under the crown created since 1705, are capable of being elected or sitting as members. 6. That no person having a pension under the crown during pleasure, or for any term of years, is capable of being elected or sitting. 7. That if any

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(A) 7 and 8 Will. III. c. 25. 10 Ann. c. 23. 2 Geo. II. c. 21. 18 Geo. II. c. 18. 31 Geo. II. c. 14. 3 Geo. III. c. 24.

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member accepts an office under the crown, except an officer in the army or navy accepting a new commission, his seat is void; but such member is capable of being re-elected. 8. That all knights of the shire shall be actual knights, or such notable esquires and gentlemen as have estates sufficient to be knights, and by no means of the degree of yeomen. This is reduced to a still greater certainty, by ordaining, 9. That every knight of a shire shall have a clear estate of freehold or copyhold to the value of 600 l. *per annum*, and every citizen and burgess to the value of 500 l.: except the eldest sons of peers and of persons qualified to be knights of shires, and except the members for the two universities: which somewhat balances the ascendancy which the boroughs have gained over the counties, by obliging the trading interest to make choice of landed men: and of this qualification the member must make oath, and give in the particulars in writing, at the time of his taking his seat. But, subject to these standing restrictions and disqualifications, every subject of the realm is eligible of common right: though there are instances, wherein persons in particular circumstances have forfeited that common right, and have been declared ineligible for that parliament, by a vote of the house of commons; or for ever, by an act of the legislature. But it was an unconstitutional prohibition, which was grounded on an ordinance of the house of lords, and inserted in the king's writs, for the parliament holden at Coventry, 6 Hen. IV. that no apprentice or other man of the law should be elected a knight for the shire therein: in return for which, our law-books and historians have branded this parliament with the name of *parlamentum indoctum*, or the lack-learning parliament; and Sir Edward Coke observes with some spleen, that there was never a good law made thereat.

(3.) The third point, regarding elections, is the method of proceeding therein. This is also regulated by the law of parliament, and the several statutes referred to in the margin below, (s); all which we shall blend together, and extract out of them a summary account of the method of proceeding to elections.

As soon as the parliament is summoned, the lord chancellor (or if a vacancy happens during the sitting of parliament, the speaker, by order of the house, and without such order if a vacancy happens by death in the time of a recess for upwards of 20 days) sends his warrant to the clerk of the crown in chancery; who thereupon issues out writs to the sheriff of every county, for the election of all the members to serve for that county, and every city and borough therein. Within three days after the receipt of this writ, the sheriff is to send his precept, under his seal, to the proper returning officers of the cities and boroughs, commanding them to elect their members: and the said returning officers are to proceed to election within eight days from the receipt of the precept, giving four days notice of the same; and to return the persons chosen, together with the precept, to the sheriff.

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But elections of knights of the shire must be proceeded to by the sheriffs themselves in person, at the next county-court that shall happen after the delivery of the writ. The county-court is a court held every month or oftener by the sheriff, intended to try little causes not exceeding the value of 40 s. in what part of the county he pleases to appoint for that purpose: but for the election of knights of the shire, it must be held at the most usual place. If the county-court falls upon the day of delivering the writ, or within six days after, the sheriff may adjourn the court and election to some other convenient time, not longer than 16 days, nor shorter than 10; but he cannot alter the place, without the consent of all the candidates: and, in all such cases, 10 days public notice must be given of the time and place of the election.

And, as it is essential to the very being of parliament that elections should be absolutely free, therefore all undue influences upon the electors are illegal, and strongly prohibited. For Mr Locke ranks it among those breaches of trust in the executive magistracy, which, according to his notions, amount to a dissolution of the government, "if he employs the force, treasure, and offices of the society to corrupt the representatives, or openly to pre-engage the electors, and prescribe what manner of persons shall be chosen: For thus to regulate candidates and electors, and new-model the ways of election, what is it (says he) but to cut up the government by the roots and poison the very fountain of public security?" As soon, therefore, as the time and place of election, either in counties or boroughs, are fixed, all soldiers quartered in the place are to remove, at least one day before the election, to the distance of two miles or more; and not to return till one day after the poll is ended. Riots likewise have been frequently determined to make an election void. By vote also of the house of commons, to whom alone belongs the power of determining contested elections, no lord of parliament, or lord lieutenant of a county, hath any right to interfere in the election of commons; and, by statute, the lord warden of the cinque-ports shall not recommend any members there. If any officer of the excise, customs, stamps, or certain other branches of the revenue, presumes to intermeddle in elections, by persuading any voter or dissuading him, he forfeits L. 100, and is disabled to hold any office.

Thus are the electors of one branch of the legislature secured from any undue influence from either of the other two, and from all external violence and compulsion. But the greatest danger is that in which themselves co-operate, by the infamous practice of bribery and corruption. To prevent which it is enacted, that no candidate shall, after the date (usually called the *teste*) of the writs, or after the vacancy, give any money or entertainment to his electors, or promise to give any, either to particular persons, or to the place in general, in order to his being elected; on

(s) 7 Hen. IV. c. 15. 8 Hen. 6. c. 7. 23 Hen. VI. c. 14. 1 W. & M. ft. 1. c. 2. 2 W. & M. ft. 1. c. 7. 5 & 6 W. & M. c. 20. 7 W. III. c. 4. 7 & 8 W. III. c. 7. and c. 25. 10 & 11 W. III. c. 7. 12 & 13 W. III. c. 10. 6 Ann. c. 23. 9 Ann. c. 5. 10 Ann. c. 19. and c. 33. 2 Geo. II. c. 24. 8 Geo. II. c. 30. 18 Geo. II. c. 18. 19 Geo. II. c. 28. 10 Geo. III. c. 16. 14 Geo. III. c. 42. 14 Geo. III. c. 15.

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on pain of being incapable to serve for that place in parliament. And if any money, gift, office, employment, or reward be given, or promised to be given, to any voter, at any time, in order to influence him to give or withhold his vote, as well he that takes as he that offers such bribe forfeits L. 500. and is for ever disabled from voting and holding any office in any corporation; unless, before conviction, he will discover some other offender of the same kind, and then he is indemnified for his own offence. The first instance that occurs of election bribery, was so early as 13 Eliz. when one Thomas Longe (being a simple man, and of small capacity to serve in parliament) acknowledged that he had given the returning officer and others of the borough for which he was chosen four pounds to be returned member, and was for that premium elected. But for this offence the borough was amerced, the member was removed, and the officer fined and imprisoned. But as this practice hath since taken much deeper and more universal root, it hath occasioned the making of these wholesome statutes; to complete the efficacy of which, there is nothing wanting but reformation and integrity to put them in strict execution.

Undue influence being thus guarded against, the election is to be proceeded to on the day appointed; the sheriff or other returning officer first taking an oath against bribery, and for the due execution of his office. The candidates likewise, if required, must swear to their qualification, and the electors in counties to theirs; and the electors both in counties and boroughs are also compellable to take the oath of abjuration, and that against bribery and corruption. And it might not be amiss, if the members elected were bound to take the latter oath as well as the former; which, in all probability, would be much more effectual than administering it only to the electors.

The election being closed, the returning officer in boroughs returns his precept to the sheriff, with the persons elected by the majority: and the sheriff returns the whole, together with the writ for the county and the knights elected thereupon, to the clerk of the crown in chancery; before the day of meeting, if it be a new parliament, or within 14 days after the election, if it be an occasional vacancy; and this under penalty of L. 500. If the sheriff does not return such knights only as are duly elected, he forfeits, by the old statutes of Henry VI. L. 100; and the returning officer in boroughs, for a like false return, L. 40; and they are besides liable to an action, in which double damages shall be recovered, by the later statutes of king William: and any person bribing the returning officer shall also forfeit L. 300. But the members returned by him are the sitting members, until the house of commons, upon petition, shall adjudge the return to be false and illegal. The form and manner of proceeding upon such petition are now regulated by statute 10 Geo. III. c. 16. (amended by 11 Geo. III. c. 42. and made perpetual by 14 Geo. III. c. 15.), which directs the method of choosing by lot a select committee of 15 members, who are sworn well and truly to try the same, and a true judgment to give, according to the evidence.

ELECTION of Scots Peers. See LORDS.

ELECTION of Ecclesiastical Persons. Elections for the

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dignities of the church ought to be free, according to the stat. 9 Ed. II. cap. 14. If any persons, that have a voice in elections, take any reward for an election in any church, college, school, &c. the election shall be void. And if any persons of such societies resign their places to others for reward, they incur a forfeiture of double the sum; and both the parties are rendered incapable of the place. Stat. 31 Eliz. cap. 6.

ELECTION of a Verderor of the Forest (*electio viridarium foreste*), in law, a writ that lies for the choice of a verderor, where any of the verderors of the forest are dead, or removed from their offices. This writ is directed to the sheriff, and the verderor is to be elected by the freeholders of the county, in the same manner as coroners. New. Nat. Brev. 366.

ELECTION is also the state of a person who is left to his own free will, to take or do either one thing or another, which he pleases. See LIBERTY.

ELECTION, in theology, signifies the choice which God, of his good pleasure, makes of angels or men, for the objects of mercy and grace.

The election of the Jews was the choice God made of that people to be more immediately attached to his worship and service, and for the Messiah to be born of them. And thus particular nations were elected to the participation of the outward blessings of Christianity.

ELECTION also, in the language of some divines, signifies a predestination to grace and glory, and sometimes to glory only. And it has been enjoined as an article of faith, that predestination to grace is gratuitous, merely and simply so; *gratia, quia gratis data*. But the divines are much divided as to the point, whether election to glory be gratuitous, or whether it supposes obedience and good works, *i. e.* whether it be before or after the provision of our obedience. See GRACE, and REPROBATION.

ELECTIVE, something that is done, or passes, by election. See ELECTOR.

Some benefices are elective, others collative. Municipal offices in England are generally elective; in Spain, venal. Poland is an elective kingdom.

ELECTIVE Attraction. See *CHEMISTRY-Index*.

ELECTOR, a person who has a right to elect or choose another to an office, honour, &c. See **ELECTION**.

Electors is particularly, and by way of eminence, applied to those princes of Germany in whom lies the right of electing the emperor; being all sovereign princes, and the principal members of the empire.

The electoral college, consisting of all the electors of the empire, is the most illustrious and august body in Europe. Bellarmine and Baronius attribute the institution of it to pope Gregory V. and the emperor Otto III. in the tenth century; of which opinion are the generality of historians, and particularly the canonists: however, the number of electors was unsettled, at least, till the 13th century. In 1356 Charles IV. by the golden bull, fixed the number of electors to seven; three ecclesiastics, viz. the archbishops of Mentz, Treves, and Cologne; and four seculars, viz. the king of Bohemia, count Palatine of the Rhine, duke of Saxony, and marquis of Brandenburg. In 1648 this order was changed, the duke of Bavaria being put in the place of the count Palatine, who having accepted the crown of Bohemia was outlawed by the emperor.

Elector. but being at length restored, an eight electorate was created for the duke of Bavaria. In 1692, a ninth electorate was created, by the emperor Leopold, in favour of the duke of Hanover, of the house of Brunswick Lunenburg.

There is this difference between the secular and ecclesiastical electors, that the first have an active and passive voice, that is, may choose and be chosen; the last, an active only. The three archbishops are to be 30 years old, before they can be advanced to the dignity; the seculars, 18, before they can perform the office themselves. These last have each their vicars, who officiate in their absence.

Besides the power of choosing an emperor, the electors have also that of capitulating with and deposing him; so that, if there be one suffrage wanting, a protest may be entered against the proceedings. By the right of capitulation, they attribute to themselves great privileges, as making of war, coining, and taking care of the public interest and security of the states; and the emperor promises, upon oath, to receive the empire upon these conditions.

The electors have precedence of all other princes of the empire, even of cardinals and kings; and are addressed under the title of *electoral highnesses*.

Their several functions are as follow. The elector of

Mentz is chancellor of Germany, convokes the states, **Electorate, Electric.** and gives his vote before any of the rest. The elector of Cologne is grand chancellor of Italy, and consecrates the emperor. The elector of Treves is chancellor of the Gauls, and confers imposition of hands upon the emperor. The count Palatine of the Rhine is great treasurer of the empire, and presents the emperor with a globe at his coronation. The elector of Bavaria is great master of the imperial palace, and carries the golden apple. The marquis of Brandenburg is grand chamberlain, and puts the ring on the emperor's finger. The elector of Saxony is grand marshal, and gives the sword to the emperor. The king of Bohemia is grand butler, and puts Charlemagne's crown on the emperor's head. Lastly, the elector of Hanover, now king of Great Britain, is arch-treasurer, tho' first erected under the title of *standard-bearer of the empire*.

ELECTORATE, a term used as well to signify the dignity of, as the territories belonging to, any of the electors of Germany; such are Bavaria, Saxony, &c. See **ELECTOR**.

ELECTRIC, derived from *ἤλεκτρον*, "amber," in physics, is a term applied to those substances, in which the electric fluid is capable of being excited, and accumulated without transmitting it, and therefore called *non-conductors*. See **ELECTRICITY**.

E L E C T R I C I T Y,

IN general, signifies the operations of a very subtle fluid, in most cases invisible, but which sometimes becomes the object of our sight and other senses, discovering itself to be one of the chief agents employed in producing the phenomena of nature.

SECT. I. Definitions of Terms used in the Science.

BEFORE we can enter upon this science with propriety, even so far as to give an history of its rise and progress, it seems necessary to give some explanation of the terms made use of by writers on electricity, that the reader may not be embarrassed with words whose meaning he cannot perhaps easily comprehend.

1. The foundation of all that is known upon this subject, is the difference between electric bodies and such as are not. The former may generally be distinguished by their attracting and repelling light substances, which the latter cannot be made to do. The principal electric bodies are glass, amber, sealing-wax, gum-lac, sulphur, rosin, &c. They are often called *non-conductors*, or *electrics per se*.

2. The usual way in which the electric power of any body can be discovered, is by rubbing it with some soft substance, generally woollen, silk, or fur; and, according to the strength of the electric virtue, the former body will attract and repel light substances presented to it at a greater or less distance. If the virtue is very strong, the electric body will emit sparks, or even strong flashes of fire, to a considerable distance. In some cases electricity discovers itself by heating the body, or blowing air upon it; but in both these ways it is much weaker than that produced by rubbing. In

whatever way this power is made to show itself, the substance possessed of it is said to be *excited*.

3. *Conductors*, called also *non-electrics*, are such substances as, though incapable of being excited, can yet in certain circumstances convey the electric power from one body to another, and that to any imaginable distance. The best conductors are metals of all kinds, charcoal, and water.

4. *Electrics*, we have already observed, are also called *non-conductors*; and this name they have from their power of stopping the communication of the electric virtue from one body to another. Thus, though any conductor be placed properly for receiving the virtue from an excited electric, none will pass to it if any electric substance be interposed; or, if the conductor be terminated by an electric, none will pass beyond the place where the electric substance begins.

5. Insulation is when a conducting substance is placed upon an electric, so that any power communicated to it cannot pass off. It must be remembered, however, that all this is to be understood with some degree of limitation; for there is no substance either a perfect electric, or a perfect conductor; the best conductors making a sensible resistance to the passage of the fluid through them when they are very long; and the most perfect electrics transmitting some of the fluid over, or through them. Indeed, though these two different kinds of substances seem to be so far removed from one another, they in reality approach to a surprising degree, inasmuch that there are many substances which can be excited as electrics, and yet have a very considerable conducting power.

6. The effects of the electric fluid discovering themselves

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selfes either by attraction and repulsion, or by emitting streams, or pencils as they are called, of blue light, are all classed under the general word *electricity*; and any body to which that power of attraction and repulsion, &c. is communicated, is said to be *electricified*. If its virtue is inherent in itself, it is said to be *excited*.

7. Electricity is found to be of two kinds; the one called *negative*, and the other *positive*. It is uncertain in what the difference betwixt these two consists. Dr Franklin is of opinion that the former consists in a superabundance of the fluid, or when more is thrown upon any substance than it can conveniently contain; the other, when a part of it is abstracted, and the body contains less than it naturally ought to do. Other theorists suppose, that when the fluid is directed outwards from any substance, that substance will in all cases be electricified positively; and that when the fluid is either entering or has a tendency to enter into any substance, it will then be electricified negatively. This question will be discussed in the course of the treatise.—The most remarkable differences we can perceive between the positive and negative electricities are that they attract each other, though strongly repulsive of themselves; that is, two bodies positively electricified, or negatively electricified, repel each other; but one body positively electricified will attract another negatively so; and if the electricities are very strong, a spark will be observed between them at meeting. These electricities are produced naturally by exciting different substances, or by using a different rubber to the same substance. Thus, glass usually produces the positive electricity; but by using a certain kind of rubber, or altering the smoothness of its surface, it may be made to produce the negative kind. The two electricities are sometimes called the *vitreous* and *resinous*, as well as positive and negative.

SECT. II. History of Electricity.

THOUGH it is certain that, ever since the creation of the world, the fluid we speak of hath had the same share in all the natural operations that it hath just now; yet the discovery of its action, and even of its existence, is, comparatively speaking, of a very late date. Thales the Milesian, who lived about 600 years before Christ, was the first that observed the electrical properties of amber. Of these, indeed, he knew no more than that this substance would attract light bodies when it was rubbed. For 300 years after his time, we hear nothing further concerning this subject. Theophrastus then tells us, that the *lyncurium* (the same substance now called the *tourmalin*), has the property of attracting light bodies, as well as amber. From this time, there is a chasm in the history of electricity for no less than 1900 years. Indeed, it is scarce to be supposed that during this long interval any person applied himself to the investigation of the subject; as, for the greatest part of it, science of every kind was almost totally extinguished. The electrical properties of jet, however, and, according to Mr Bose, of the agate, were some way or other discovered during the abovementioned period. But it was not till the beginning of the 17th century, that the subject of electricity became properly a distinct science, and the found-

ation was laid of those discoveries which have since taken place.

The first who can properly be called an *electrician* was Dr William Gilbert, who, in the year 1600, wrote a book of *Magnetice*, which contains a variety of electrical experiments. All these, however, considered only the attractive property of certain substances, which, from their agreement in this respect with amber (in Latin *electrum*), were called *electric*. Dr Gilbert's merit consists in his having been at great pains to find out a number of such substances, and thus considerably enlarging the number of electrics.

Till the year 1670, it doth not appear that any farther discoveries were made; except some trifling additions to the catalogue of electrics. About this time, Mr Boyle applied himself to the study of electricity. He enlarged the catalogue of electrics; and found that their electric properties were increased by wiping and warming them before they were rubbed. He observed also, that all kinds of bodies were attracted promiscuously; and imagined that they were attracted in *vacuo* as well as in air. This last position, however, is denied by Mr Beccaria; and we shall afterwards show that Mr Boyle must necessarily have been mistaken. He also observed the electric light, though only in the instance of some diamonds.

Otto Guericke, however, who was cotemporary with Mr Boyle, improved the science much farther. He made use of a sulphur globe, whirled on an axis much in the same way with our present glass globes. Thus he could excite a vastly greater power of electricity than any of his predecessors, and try all their experiments to much more advantage. He discovered electric repulsion; and not only saw the electric light more clearly than Mr Boyle, but heard the hissing sound with which it is emitted. He also made another remarkable discovery, but which has since been very generally overlooked; namely, that a feather, when repelled by an excited electric, always keeps the same face towards the body which repels it, as the moon does to the earth.

The next discovery of any moment was made by Sir Isaac Newton, who observed, that the electric attraction and repulsion penetrated through glass; and it is much to be regretted that this accurate philosopher did not apply himself to the study of electricity with greater assiduity.

In 1709, a treatise was written on electricity by Mr Hauksbee; who not only far excelled all his predecessors and cotemporaries, but also made some discoveries which well deserve the attention of the most expert electricians at this day. Besides a variety of new experiments made upon electric attraction and repulsion, as well as the light emitted by electric bodies; he found a method of rendering opaque bodies transparent by means of electricity. He lined more than half the inside of a glass globe with sealing-wax; and having exhausted the globe, he put it in motion; when applying his hand to excite it, he saw the shape and figure of all the parts of his hand distinctly and perfectly, on the concave superficies of the wax within, just as if only pure glass without any wax at all had been interposed between his eye and his hand. The lining of wax, where it was spread the thinnest, would

Electricity when first mentioned.

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Discoveries of Dr Gilbert.

Discoveries of Otto Guericke and Sir Isaac Newton.

Remarks on the discoveries of Mr Hauksbee.

History.

but just allow the light of a candle through it in the dark; but in some places the wax was at least an eighth part of an inch thick. Yet, even in these places, the light and figure of his hand were as distinguishable through it as any where else. The sealing-wax did not adhere to the glass in all places; but this made no difference with regard to the transparency. Pitch answered the purpose equally well with sealing-wax.

M. Hauksbee also made a farther improvement, by using a glass globe, which acts much more powerfully than a sulphur one. After his death, however, not only the use of glass globes, but even the study of electricity itself, seems to have been pretty generally laid aside for some time. The reason of this was, that the recent discoveries of Sir Isaac Newton engrossed the attention of philosophers to such a degree, that they had no leisure for any thing else. After the death of that great man, however, the science of electricity began to revive; and, in 1729, a capital discovery was made by Mr Stephen Grey. This was the distinction between conductors and non-conductors of electricity. As the discovery was entirely accidental, and attended with several curious circumstances, we shall here give some account of it. In the month of February 1729, Mr Grey, after some fruitless attempts to excite an electric power in metals, recollected a suspicion he had for some time entertained, that as a glass tube, when excited in the dark, communicated its light to various bodies, it might at the same time possibly communicate to them an electricity; that is, a power of attracting light bodies; which, as yet, was all that was understood by the word *electricity*. For this purpose he provided himself with a glass tube, three feet five inches long, and near one inch and two-tenths in diameter. To each end was fitted a cork; to keep the dust out when the tube was not in use. His first experiments were made with a view to determine whether the tube would attract equally well with the ends shut as with them open. In this respect there was no difference; but he found that the corks attracted and repelled light substances as well, and rather better, than the tube itself. He then fixed an ivory ball upon a stalk of fir about four inches long, and thrusting the end of the stalk into one of the corks, he found the ball endowed with a strong attractive and repulsive virtue. This experiment he repeated in many different ways; fixing the ball upon long sticks, and upon pieces of brass and iron wire, always with the same success; but he constantly observed, that the ball at the end attracted more vigorously than that part of the wire nearest the tube.

The inconvenience of using long wires in this manner, put Mr Grey upon trying whether the ball might be suspended by a pack-thread with a loop on the tube, with equal success; and the event fully answered his expectation. Having thus suspended bodies of the greatest length he conveniently could, to his tube, he ascended a balcony 26 feet high, and fastening a string to his tube, found that the ball would attract light bodies on the ground below. This experiment succeeded in the greatest heights to which he could ascend; after which, he attempted to carry the electricity horizontally. His first attempt miscarried, because he suspended his line, which was intended to carry the electricity horizontally, by a pack-thread; and thus the

fluid got off from it; but though Mr Grey knew this was the case, he could not at any time think of any method to prevent it.

On the 30th of June 1729, Mr Grey paid a visit to Mr Wheeler, in order to give him a specimen of his experiments; but told him of the unsuccessful attempt he had made to carry the electric fluid horizontally. Mr Wheeler proposed to suspend the conducting line by *silk* instead of *pack-thread*. For this advice he could give no reason, but that the silk thread was *smaller* than the other: however, with it they succeeded perfectly well. Their first experiment was in a matted gallery at Mr Wheeler's house, on the 2d of July 1729. About four feet from the end of the gallery they fastened a line across the place. The middle of this line was silk, the rest pack-thread. Over the silken part they laid one end of the conducting line, to which was fastened the ivory ball, and which hung down about nine feet below the line stretched across the gallery. The conducting line was 80½ feet in length, and the other end of it was fastened by a loop to the electric tube. Upon rubbing the tube, the ivory ball attracted and repelled light substances as the tube itself would have done. They next contrived to return the line, so that the whole length of it amounted to 147 feet; which also answered pretty well. But, suspecting that the attraction would be stronger without doubling or returning the line, they made use of one carried straight forward for 124 feet; and, as they expected, found the attraction in this manner stronger than when the line had been doubled. Thus they proceeded with their experiments; still adding more conducting line, till at last their silk string broke with the weight. This they endeavoured to supply, first with a small iron-wire, and then with a brass one. The result of these experiments, however, soon convinced them that the silk refused to conduct the electric fluid, not on account of its *smallness*, as they had supposed, but on account of some difference in the matter. The wires were smaller than the silk-thread, yet the electricity was effectually carried off by them. They had recourse, therefore, to thicker lines of silk; and thus conveyed the electric matter to the distance of 765 feet; nor did they perceive the virtue to be at all diminished by the distance to which it was carried.

This discovery of the non-conducting power of silk was quickly followed by a discovery of the same power in many other substances; and thus, in fact, the foundation of almost all the subsequent improvements in electricity was laid; though in the sciences, as well as in most others, few discoveries have been made by reasoning, but many by accident. Mr Grey continued to study electricity as long as he lived; and has given a set of experiments, of which Dr Priestley says, "It is not easy to know what to make of them." He imagined that he had discovered in all electric substances a *perpetual attractive power*, which required no kind of excitation either by heating, rubbing, or any kind of attrition. He took 19 different substances, which were either rosin, gum-lac, shell-lac, bees-wax, sulphur, pitch, or two or three of these differently compounded. These he melted in a spherical iron ladle; except the sulphur, which was best done in a glass vessel. When these were taken out of the ladle, and their spherical surface hardened, he says they would

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Difference
between e-
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He disco-
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would not attract till the heat was abated, or till they came to a certain degree of warmth; that there was then a small attraction, which increased till the substance was cold, when it was very considerable. The manner in which he kept these substances in a state of attraction was, by wrapping them in any thing which would preserve them from the external air. At first, for the smaller bodies he used white paper, and for the larger ones black worsted stockings would do as well. When thus wrapped up, they were put into a large firm box, where they remained till he had occasion to use them. Thus prepared, they retained their attractive virtue for four months. These experiments are similar to some others lately made and published as new discoveries.

Some other experiments were made by Mr Grey, with regard to the attraction of electric bodies *in vacuo*; and in this he determined with Mr Boyle against the opinion of Mr Beccaria above mentioned. But the most remarkable experiments mentioned by Mr Grey, are his imitations of the planetary motions. "I have lately made (says he) several new experiments upon the projectile and pendulous motions of small bodies by electricity; by which small bodies may be made to move about large ones, either in circles or ellipses; and those either concentric or eccentric to the centre of the large body about which they move, so as to make many revolutions about them. And this motion will constantly be the same way that the planets move about the sun, viz. from the right hand to the left, or from west to east. But these little planets, if I may so call them, move much faster in their apogee than in the perigee parts of their orbits; which is directly contrary to the motion of the planets about the sun." The manner in which these experiments were made, as delivered by him on his death-bed to Dr Mortimer, was as follows: "Place a small iron globe (said he), of an inch or an inch and an half in diameter, on the middle of a circular cake of rosin, seven or eight inches in diameter, gently excited; and then a light body suspended by a very fine thread, five or six inches long, held in the hand over the centre of the cake, will, of itself, begin to move in a circle round the iron globe, and constantly from west to east. If the globe is placed at any distance from the centre of the circular cake, it will describe an ellipse, which will have the same eccentricity as the distance of the globe from the centre of the cake. If the cake of rosin be of an elliptical form, and the iron globe be placed in the centre of it, the light body will describe an elliptical orbit of the same eccentricity with the form of the cake. If the globe be placed in or near one of the foci of the elliptical cake, the light body will move much swifter in the apogee than in the perigee of its orbit. If the iron globe is fixed on a pedestal an inch from the table, and a glass hoop, or a portion of a hollow glass cylinder excited, be placed round it, the light body will move as in the circumstances mentioned above, and with the same varieties." He said, moreover, that the light body would make the same revolutions, only smaller, round the iron globe placed on the bare table, without any electrical body to support it: but he acknowledged that he had not found the experiment succeed if the thread was supported by any thing but a human

hand, though he imagined any other animal substance would have answered the purpose.

These experiments occasioned a great deal of speculation. Dr Mortimer was the only person who was able to repeat them with success, and he only when nobody but himself was present. It was therefore generally supposed that both he and Mr Grey had been deceived; but from some experiments to be related hereafter, it seems probable that the success of Mr Grey and Dr Mortimer was owing to their having performed their experiments with candle-light; and the failure of the others, to their having attempted them by day-light. Notwithstanding which, it is more than probable that Mr Grey has been deceived in a number of particulars; for no motion can be performed by an artificial excitation of the electric fluid, but what is attended with much irregularity.

Soon after Mr Grey's discovery of the difference between conductors and non-conductors of electricity, Mr Du Fay discovered the difference between positive and negative, or, as they were for some time called, by Mr Du Fay, the *vitreous* and *resinous* electricities. This discovery was quite accidental. It was made in consequence of his casually observing, that a piece of leaf-gold, repelled by an excited glass tube, and which he meant to chase about the room with a piece of excited gum copal, instead of being repelled by it as it was by the glass tube, it was eagerly attracted. The flame was the case with sealing-wax, sulphur, rosin, and a number of other substances. He discovered also, that it was impossible to excite a tube in which the air was condensed.

In the year 1742, the use of glass globes was again introduced by Mr Bosc, professor of philosophy at Wittenburgh; though some attribute this to Christian Augustus Hansen, professor of mathematics at Leipzig. He added also a prime conductor, which consisted of a tube of iron or tin. It was at first supported by a man standing upon cakes of rosin; but afterwards suspended by silk lines horizontally before the globe. A bundle of thread was put into the end next to the globe, which not only prevented any injury to the glass, but rendered the electricity stronger.

The most remarkable discovery that hath yet been made in the science of electricity, was in the end of the year 1745, and beginning of 1746. This was the method of giving the electric shock, or the accumulation of the power of electricity in a vial. This had its name of the *Leyden vial*, from Mr Cunæus, a native of Leyden, who exhibited it as he was repeating some experiments made by Messrs Muschenbroek and Allamand, professors in the university of that city. He was not, however, the inventor. The merit of this discovery (if any merit can arise from a discovery made by accident) belongs to Mr Van Kleift, dean of the cathedral at Cambrin. On the 4th of November 1745, he sent the following account of it to Dr Leiberkuhn at Berlin: "When a nail, or a piece of thick brass wire, &c. is put into a small apothecary's vial, and electrified, remarkable effects follow: but the vial must be very dry, or warm. I commonly rub it over before-hand with a finger, on which I put some pounded chalk. If a little mercury or a few drops of spirit of wine are put into it, the experiment succeeds the better. As soon as this phial and nail are removed from the

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8
Vitreous and resinous electricities discovered by Mr Du Fay.

9
Electrical shock discovered.

7
Imagines he can imitate the planetary motions.

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the electrifying glass, or the prime conductor to which it hath been exposed is taken away, it throws out a pencil of flame so long, that with this burning machine in my hand, I have taken above 60 steps in walking about my room. When it is electrified strongly, I can take it into another room, and there fire spirits of wine with it. If while it is electrifying, I put my finger, or a piece of gold which I hold in my hand, to the nail, I receive a shock which stuns my arms and shoulders.

"A tin tube, or a man placed upon electric, is electrified much stronger by this means than in the common way. When I present this vial and nail to a tin tube, which I have 15 feet long, nothing but experience can make a person believe how strongly it is electrified. Two thin glasses have been broken by the shock of it."

Soon after this, a method of giving the shock was discovered in Holland by Mr Cuneus, in the following manner: M. Muschenbrock and his friends, observing that electrified bodies exposed to the common atmosphere, which is always replete with conducting particles of various kinds, soon lost their electricity, and were capable of retaining but a small quantity of it; imagined, that, were the electrified bodies terminated on all sides by original electric, they might be capable of receiving a stronger power and retaining it for a longer time. Glasses being the most convenient electric for this purpose, and water the most convenient non-electric, they first made these experiments with water in glass bottles: but no considerable discovery was made, till Mr Cuneus, happening to hold his glass vessel in one hand, and endeavouring to disengage it from the conductor with the other (when he imagined the water had received as much electricity as the machine could give it), was surprised with a sudden shock in his arms and breast, which he had not in the least expected.

TO
Behaviour
of different
philosophers
on this occasion.

The discovery of such a terrible effect of the electric power immediately raised the attention of all the philosophers in Europe. Many of them greatly exaggerated their accounts; either from a natural timidity, or their love of the marvellous. Mr Muschenbrock, who tried the experiment with a very thin glass bowl, told Mr Reaumur in a letter wrote soon after the experiment, That he felt himself struck in his arms, shoulder, and breast, so that he lost his breath; and was two days before he recovered from the effects of the blow and the terror. He added, that he would not take a second shock for the whole kingdom of France. Mr Allamand, who made the experiment, with a common beer-glass, said, that he lost his breath for some moments; and then felt such an intense pain all along his right arm, that he was apprehensive of bad consequences, but it soon after went off without any inconvenience, &c. Other philosophers, on the contrary, showed their heroism and magnanimity, by receiving a number of electric shocks as strong as they could possibly make them. Mr Bosc above mentioned, wished that he might die by the electric shock, in order to furnish, by his death, an article for the memoirs of the academy of sciences at Paris. "But (adds Dr Priestley, from whom this account is taken), it is not given to every electrician to die in so glorious a manner as the justly envied Richman."

From the time of this discovery, electricity became

the general subject of conversation. A great number of people all over Europe got their livelihood by going about and showing the phenomena of it; and, at the same time, the passion for the marvellous strongly discovered itself in some effects of electricity, pretended to be found out in Italy and Germany. It was asserted by Signior Pivati at Venice, and after him by Verati at Bologna, Mr Bianchi at Turin, and Mr Winckler at Leipzig, that if odoriferous substances were confined in glass vessels, and the vessels excited, the odours and other medicinal virtues would transpire through the glass, infect the atmosphere of the conductor, and communicate the virtue to all persons in contact with it; also, that those substances, held in the hands of persons electrified, would communicate their virtues to them; so that the medicines might be made to operate without being taken into the stomach. They even pretended to have wrought many cures by the help of electricity applied in this way. To see the wonderful effects of these *medicated tubes*, as they were called, Mr Nollet travelled into Italy, where he visited all the gentlemen who had published any account of these experiments. But tho' he engaged them to repeat their experiments in his presence, and upon himself; and though he made it his business to get all the information he could concerning them; he returned fully convinced, that in no instance had odours been found to transpire through the pores of excited glass, and that no drugs had ever communicated their virtues to people who had only held them in their hands while they were electrified. He was convinced, however, that by continued electrification without drugs, several persons had found considerable relief in various disorders; particularly, that a paralytic person had been cured at Geneva, and that one who was deaf of an ear, another who had a violent pain in his head, and a woman with a disorder in her eyes, had been cured at Bologna; so that from this time we may date the introduction of electricity into the medicinal art. See MEDICINE-Index.

Another wonderful experiment was the *beatification* of Mr Boze; which other electricians, for a long time, endeavoured to repeat after him, but to no purpose. His description of this remarkable experiment was, that if, in electrifying, large globes were employed, and the electrified person stood upon large cakes of pitch, a lambent flame would by degrees arise from the pitch, and spread itself around his feet; that from thence it would be propagated to his knees and body, till at last it ascended to his head; that then, by continuing the electrification, the person's head would be surrounded by a glory such as is in some measure represented by painters in their ornamenting the heads of saints. Dr Watson took the utmost pains to repeat this experiment. He underwent the operation several times, and was supported during the time of it by solid electric three feet high. Being electrified very strongly, he felt a kind of tingling on the skin of his head and in many other parts of his body. The sensation resembled what would arise from a vast number of insects crawling over him at the same time. He constantly observed the sensation to be the greatest in those parts of his body which were nearest to any non-electric; but no light appeared upon his head, though the experiment was several times made in the dark, and with some continuance. At last the Doc-

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It
increasable
power attributed
to electricity

tor

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Identity of
electric
fluid with
lightning
suspected
by Dr
Franklin.

tor wrote to Mr Boze himself, and his answer showed that the whole had been a trick. Mr Boze acknowledged that he had made use of a suit of armour, which was decked with many bullions of steel, some pointed like nails, others like wedges, and some pyramidal; and that when the electrification was very vigorous, the edges of the helmet would dart forth rays something like those which are painted on the heads of fauns.

The identity of the electrical matter with lightning is a discovery that hath been of more practical use to mankind than any other. From almost the first discovery of the electric light, and the crackling with which it is emitted, a similarity between it and the phenomena of thunder and lightning had been observed. This is taken notice of by Dr Wall, one of the first who viewed the electric light in any perfect manner. The Abbé Nollet, Mr Winckler, and others, also enumerated many resemblances between the phenomena of electricity and those of thunder; but they did not think of any method by which their suspicions could be brought to the test of experience. This was first proposed by Dr Franklin in 1750. He had before discovered the effects of pointed bodies in drawing off the electric matter more powerfully than others. This was suggested to him by one Mr Thomas Hopkinson, who electrified an iron ball of three or four inches diameter with a needle fastened to it, expecting to draw a stronger spark from the point of it; but was surprised to find little or none. Dr Franklin, improving on this hint, supposed that pointed rods of iron, fixed in the air when the atmosphere was loaded with lightning, might draw from it the matter of the thunder-bolt, without noise or danger, into the body of the earth. His account of this supposition is given by himself in the following words. "The electric fluid is attracted by points. We do not know whether this property be in lightning; but since they agree in all the particulars in which we can already compare them, it is not improbable, that they agree likewise in this; let the experiment be made."

13
His suspi-
cion veri-
fied.

This suspicion of Dr Franklin's was verified in 1752, and the discovery is perhaps the only one in the whole science that hath not been the result of accident. The most active persons were two French gentlemen, Messrs Dalibard and Delor. The former prepared his apparatus at Marly la Ville, situated five or six leagues from Paris; the other at his own house, on some of the highest ground in that capital. Mr Dalibard's machine consisted of an iron rod 40 feet long, the lower extremity of which was brought into a centry-box, where the rain could not come; while on the outside it was fastened to three wooden posts by long silken strings defended from the rain. This machine happened to be the first that was favoured with a visit of the ethereal fire. Mr Dalibard himself was not at home; but, in his absence, he had entrusted the care of his apparatus to one Coiffier a joiner, who had served 14 years among the dragoons, and on whose courage and understanding he could depend. This artisan had all the necessary instructions given him; and was desired to call some of his neighbours, particularly the curate of the parish, whenever there should be any appearance of a thunder storm. At length the long expected event arrived. On Wednesday the 10th of May 1752, between two and three in the afternoon, Coiffier heard

a pretty loud clap of thunder. Immediately he ran to the machine, taking with him a phial furnished with a brads wire; and presenting the wire to the end of the rod, a small spark issued from it with a snap like that which attends a spark from an electrified conductor. Stronger sparks were afterwards drawn in the presence of the curate and a number of other people. The curate's account of them was, that they were of a blue colour, an inch and an half in length, and smelled strongly of sulphur. In making them, he received a stroke on his arm a little below the elbow; but he could not tell whether it came from the brads wire inserted into the phial, or from the bar. He did not attend to it at the time; but the pain continuing, he uncovered his arm when he went home in the presence of Coiffier. A mark was perceived round it, such as might have been made by a blow with the wire on his naked skin.

About a month after this, Dr Franklin himself had an opportunity of verifying his own hypothesis. He was waiting for the erection of a spire in the city of Philadelphia, not imagining that a pointed rod of a moderate height could answer the purpose. At last it occurred to him, that by means of a common kite he could have a readier access to the higher regions of the atmosphere than any other way whatever. Preparing, therefore, a large silk handkerchief and two cross sticks of a proper length on which to extend it, he took the opportunity of the first approaching thunder-storm to take a walk into a field where there was a shed convenient for his purpose. But dreading the ridicule which too commonly attends unsuccessful attempts in science, he communicated his intention to nobody but his son, who assisted him in raising the kite. A considerable time elapsed before there was any appearance of success. One very promising cloud had passed over the kite without any effect; when, just as he was beginning to despair, he observed some loose threads of the hempen string to stand erect and avoid one another, just as if they had been suspended by the conductor of a common electrical machine. On this he presented his knuckle to a key which was fastened to the string, and thus obtained a very evident electric spark. Others succeeded even before the string was wet; but when the rain had begun to descend, he collected electric fire pretty copiously. He had afterwards an insulated iron rod to draw the lightning into his house; and performed almost every experiment with real lightning that had before been done with the artificial representations of it by electrical machines.

Thus a new field was opened for philosophers; but it was soon found, that experiments of this kind were not always to be made without danger. This very year, 1752, the Abbe Nollet published some cautions to those who tried experiments on lightning. He had been informed by letters from Florence and Bologna, that some people there had received violent shocks while they drew sparks from an iron bar electrified by thunder. One of his correspondents informed him, that once, as he was endeavouring to fasten a small chain with a copper ball at one of its extremities to a great chain which communicated with the bar at the top of the building, there came a flash of lightning which he did not see, but which affected the chain with a noise like that of wild-fire. The observer in-

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Danger of
making ex-
periments
with light-
ning.

stantly

History.

stantly received such a shock, that the ball fell out of his hands, and he was struck backwards four or five paces.

15
Professor
Richman
killed by
lightning.

The greatest instance of the danger of these experiments, however, was the death of Mr Richman professor at Peterburgh above-mentioned. This happened on the 6th of August 1753, as he was making experiments on lightning drawn into his own room. He had provided himself with an instrument for measuring the quantity of electricity communicated to his apparatus; and as he stood with his head inclined to it, Mr Solokow an engraver, who was near him, observed a globe of blue fire, as big as his fist, jump from the instrument, which was about a foot distant, to Mr Richman's head. The professor was instantly dead, and Mr Solokow was also much hurt. The latter, however, could give no particular account of the way in which he was affected; for, at the time the professor was struck, there arose a sort of steam or vapour, which entirely benumbed him, and made him sink down to the ground, so that he could not even remember to have heard the clap of thunder, which was a very loud one. The globe of fire was attended with an explosion like that of a pistol; the instrument for measuring the electricity (called by the professor an *electrical gnomon*), was broken to pieces, and the fragments thrown about the room. Upon examining the effects of the lightning in the professor's chamber, they found the door-case half split through, and the door torn off and thrown into the room. They opened a vein in the body twice, but no blood followed; after which, they endeavoured to recover life by violent friction, but in vain: upon turning the corpse with the face downwards during the rubbing, an inconsiderable quantity of blood ran out of the mouth. There appeared a red spot on the forehead, from which spirted some drops of blood through the pores, without wounding the skin. The shoe belonging to the left foot was burst open, and uncovering the foot at that part, they found a blue mark; from whence it was concluded, that the electric matter having entered at the head, made its way out again at that foot. Upon the body, particularly on the left side, were several red and blue spots resembling leather shrunk by being burnt. Many more also became visible over the whole body, and particularly over the back. That upon the forehead changed to a brownish red, but the hair of the head was not singed. In the place where the shoe was unripped, the stocking was entire; as was the coat every where, the waistcoat only being singed on the forehead where it joined the hinder: but there appeared on the back of Mr Solokow's coat long narrow streaks, as if red-hot wires had burned off the nap, and which could not well be accounted for.

When the professor's body was opened next day, the cranium was very entire, having neither fissure nor contra-fissure: the brain was found; but the transparent pellicles of the wind-pipe were excessively tender, and easily rent. There was some extravasated blood in it, as also in the cavities below the lungs. Those of the breast were quite sound; but those towards the back of a brownish black colour, and filled with more of the blood above mentioned. The throat, the glands, and the small intestines, were all inflamed. The singed leather-coloured spots penetrated the skin only. In 48

NO 111.

hours the body was so much corrupted that they could scarce get it into a coffin.

Since the discovery of the identity of lightning and the electric matter, long rods of iron or other metal have been made use of with a view to protect buildings from the danger of strokes of lightning. A considerable dispute has been carried on whether these rods ought to be pointed or not; but a committee of the royal society have very lately determined it in favour of the former.

For some time, the science of electricity seems to have been at a stand. Numberless improvements indeed have been made upon what was before discovered, but scarce any thing new hath been added. The only thing which can properly be reckoned a new discovery is that of the *electrophorus* by Signior Volta an Italian; which on many accounts may be reckoned the most surprising machine hitherto invented.

SECT. III. Of the Apparatus necessary for exciting Electricity, and communicating it to other Bodies, &c.

THE instruments most in use for this purpose are those called *electrical machines*, of which there have been so many different forms, that it would be tedious and difficult to give only a very short description of them all. We shall therefore first lay down the most necessary rules for constructing electrical machines in general; and then give a particular description of those machines which are most generally useful, and contain all the improvements hitherto made.

§ 1. Of the Construction of Electrical Machines.

THE principal parts of the machine are the electric, the moving engine, and the prime conductor, *i. e.* an insulated conductor, which immediately receives the electricity from the excited electric.

Formerly, different kinds of electric were used, as What substances are most proper.
glasses, rosin, sulphur, sealing-wax, &c. Their forms were also various, as globes, cylinders, spheroids, &c. The reason of this variety was, in the first place, that it was not then ascertained what substance acted most powerfully; and secondly, in order to produce a positive or negative electricity at pleasure. At present smooth glass only is used; for when the machine has an insulated rubber, the operator may produce positive or negative electricity at his pleasure, without changing the electric. In regard to the form of the glass, those commonly used at present are globes and cylinders. The most convenient size for a globe, is from nine to twelve inches diameter. They are made with one neck, which is cemented to a strong brass cap in order to adapt them to a proper frame. The best cement for electrical purposes is made with two parts of rosin, two of bees-wax, and one of the powder of red ochre. These ingredients are melted, and mixed together in any vessel over the fire; and afterwards kept for use. This kind of cement sticks very fast; and is much preferable to rosin only, as it is not so brittle, and at the same time insulates equally well. The cylinders are made with two necks; they are used to the greatest advantage without any axis; and their common size is from four inches diameter and eight inches long, to twelve

Slater.



Echinus. 2



Echeneis.



ELECTRICITY.

Fig. 3.

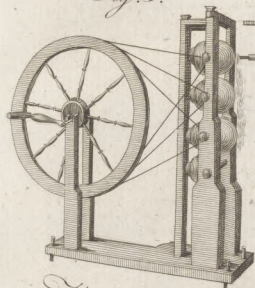


Fig. 1.



Fig. 2.

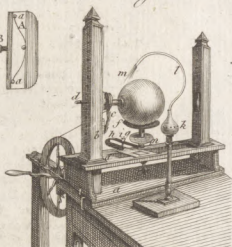


Fig. 5.

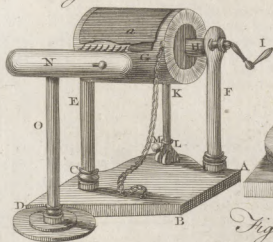


Fig. 4.

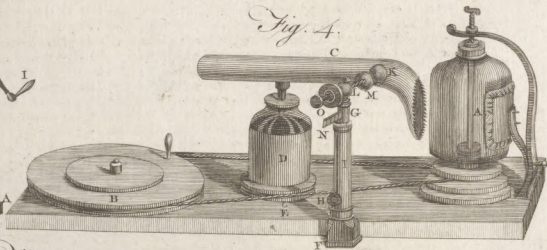


Fig. 6.

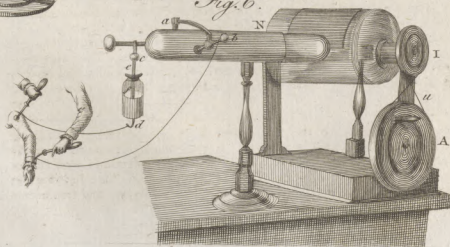
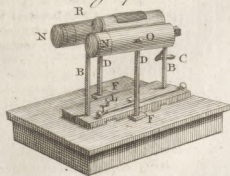
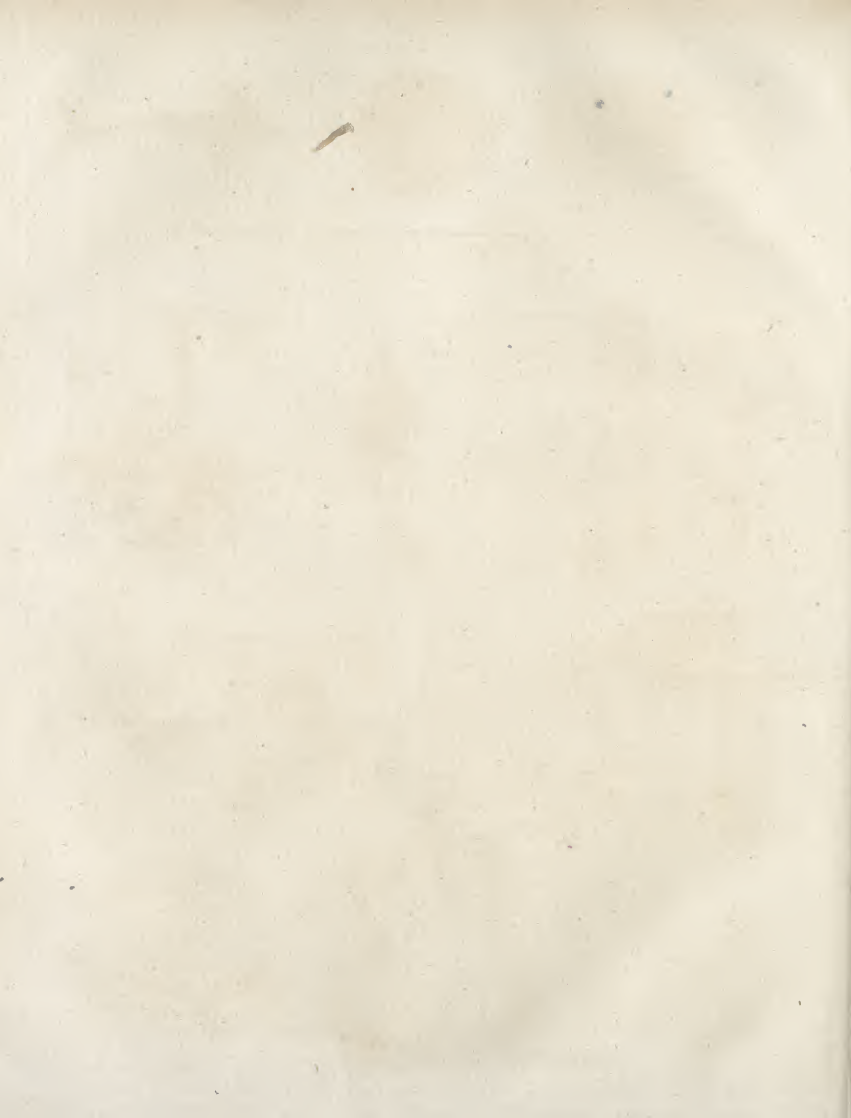


Fig. 7.





Apparatus.

20
Construc-
tion of the
rubber.

18
Composi-
tion for
coating
globes.

part of the former to five of the latter. The mercury ought to be previously triturated with some melted grease or bees-wax, by which means the amalgam will be the finer. The composition called *Aurum Musivum*, *Aurum myfivum*, or *Mojafe gold**, will answer very near as well, though somewhat less cleanly and agreeable. The rubber itself should be supported by a spring; by which means it will easily suit any inequalities that may be on the surface of the glass; and by a screw, it may be made to press more or less as occasion requires. It should likewise be insulated in the most perfect manner, so as not to be injured by contact with the rubber.

19
How the
machine is
to be set in
motion.

Mr William Jones of Holborn, London, instrument-maker, has made a considerable improvement on the part of electrical machines by a very simple contrivance. It consists in a spring placed within the rubber itself; the action of which is found to be better suited for adapting the rubber to the inequalities of the glass, than that placed entirely without the rubber. It consists of a piece of flexible iron or brass, represented edgewise by A fig. 1; and it is evident that it acts in a much more parallel and uniform manner than the

23
Mr Jones's
improved
ment on the
spring of
the rubber.
Plate
CLXXIII.

Apparatus. former, which is constantly changing; the pressure of the line of contact betwixt the rubber and cylinder while it passes from the under to the upper side, and thus rendering the effect inconstant and uncertain.

24
Prime conductor, &c. We come now to consider the prime conductor, or first conductor; which is nothing more than an insulated conducting substance, furnished with one or more points at one end, in order to collect the electricity immediately from the electric. When the conductor is of a moderate size, it is usual to make it of hollow brass; but when it is very large, then, on account of the price of the materials, it is made of pasteboard covered with tin-foil or gilt paper. The conductor is generally made cylindrical; but let the form be what it will, it should always be made perfectly free from points or sharp edges: and if holes are to be made in it, which on many accounts are very convenient, they should be well rounded, and made perfectly smooth. Further, that end of the prime conductor which is at the greatest distance from the electric ought to be made larger than the rest, as the strongest exertion of the electric fluid in escaping from the conductor is always at that end.

It has been constantly observed, that the larger the prime conductor is, the longer and denser spark can be drawn from it; and the reason of this is, that the quantity of electricity discharged in a spark, is nearly proportional to the size of the conductor: on this account, the prime conductor is now made much larger than what was formerly used. Its size, however, may be so large, that the dissipation of the electricity from its surface, may be greater than what the electric can supply; in which case, so large a conductor would be nothing more than an unwieldy and disagreeable incumbrance.

Before we quit the electrical machine, it should be observed, that, besides the above-mentioned parts, it is necessary to have a strong frame to support the electric, the rubber, and the wheel. The prime conductor should be supported by stands, with pillars of glass or baked wood, and not by silk strings, which admit of continual motion. In short, the machine, the prime conductor, and any other apparatus actually used, should be made to stand as steady as possible, otherwise many inconveniences will arise.

Besides the electrical machine, the electrician should be provided with glass tubes of different sizes, a pretty large flask of sealing-wax, or a glass tube covered with sealing-wax, for the negative electricity. He should, at least, not be without a glass tube about three feet long and one inch and a half in diameter. This tube should be closed at one end, and at the other end should have fixed a brass cap with a stop-cock; which is useful in case it should be required to condense or rarify the air within the tube.

The best rubber for a tube of smooth glass is the rough side of black oiled silk, especially when it has some amalgam rubbed upon it; but the best rubber for a rough glass tube, a stick of baked wood, sealing-wax, or sulphur, is lost new flannel.

25
Directions for coating jars, &c. The instruments necessary for the accumulation of electricity are coated electric; among which, glass coated with conductors obtains the principal place: on account of its strength, it may be formed into any shape, and it will receive a very great charge. The

form of the glass is immaterial with respect to the charge it will contain; its thickness only is to be considered: for the thinner it is, the more easily will it receive the utmost charge it can bear; but it is at the same time more subject to be broken: for this reason, therefore, a thin coated jar or plate may be used very well by itself, and it is very convenient for many experiments; but when large batteries are to be constructed, then it is necessary to use glass a little thicker, and care should be taken to have them perfectly well annealed. If a battery is required of no very great power, as containing about eight or nine square feet of coated glass, common pint or half-pint phials may be made use of. They may be easily coated with tin-foil, sheet-lead, or gilt-paper, on the outside, and brass-slings on the inside: they occupy a small space, and, on account of their thinness, hold a very good charge. But when a large battery is required, then these phials cannot be used, for they break very easily; and for that purpose, cylindrical glass jars of about 15 inches high, and four or five inches in diameter, are the most convenient.

When glass plates or jars, having a sufficiently large opening, are to be coated, the best method is to coat them with tin-foil on both sides, which may be fixed upon the glass with varnish, gum-water, bees-wax, &c. but in case the jars have not an aperture large enough to admit the tin-foil, and an instrument to adapt it to the surface of the glass, then brass-slings, such as are sold by the pin-makers, may be advantageously used; and they may be stuck on with gum-water, bees-wax, &c. but not with varnish, for this is apt to be set on fire by the discharge. Care must be taken that the coatings do not come very near the mouth of the jar, for that will cause the jar to discharge itself. If the coating is about two inches below the top, it will in general do very well: but there are some kinds of glass, especially tinged glass, that when coated and charged, have the property of discharging themselves more easily than others, even when the coating is five or six inches below the edge. There is another sort of glass, like that of which Florence flasks are made, which, on account of some unvitrified particles in its substance, is not capable of holding the least charge. On these accounts, therefore, whenever a great number of jars are to be chosen for a large battery, it is advisable to try some of them first, so that their quality and power may be ascertained.

26
Electricians have often endeavoured to find some other electric, which might answer better than glass for this purpose, at least be cheaper; but, except Father Beccaria's method, which may be used very well, no remarkable discovery has been made relating to this point. He took equal quantities of very pure colophonium, and powder of marble sifted exceedingly fine, and kept them in a hot place a considerable time, where they became perfectly free from moisture: he then mixed them, and melted the composition in a proper vessel over the fire; and, when melted, poured it upon a table, upon which he had previously stuck a piece of tin-foil, reaching within two or three inches of the edge of the table. This done, he endeavoured with a hot iron to spread the mixture all over the table as equally as possible, and to the thickness of one-tenth of an inch: he afterwards coated it with another piece of tin-foil reaching within about two inches of the edge.

Apparatus.

edge of the mixture : in short, he coated a plate of this mixture like a plate of glass. This coated plate, from what he says, seems to have had a greater power than a glass plate of the same dimensions, even when the weather was not very dry : and if it is not subject to break very easily by a spontaneous discharge, it may be very conveniently used ; for it doth not very readily attract moisture, and consequently may hold a charge of electricity better, and longer, than glass : besides, if broken, it may be repaired by a hot iron ; but glass, when broken, cannot so easily be repaired.

27
Discharging rod,
electrometers, &c.

When a jar, a battery, or in general a coated electric, is to be discharged, the operator should be provided with an instrument called the *discharging rod*, which consists of a metal rod sometimes straight, but more commonly bended in the form of a C : they are made also of two joints, so as to open like a kind of compasses. This rod is furnished with metal knobs at its extremities, and has a non-conducting handle, generally of glass or baked wood, fastened to its middle. When the operator is to use this instrument, he holds it by the handle ; and touching one of the coated sides of the charged electric with one knob, and approaching the other knob to the other coated side, or some conducting substance communicating with it, he completes the communication between the two sides, and discharges the electric.

The instruments to measure the quantity, and ascertain the quality, of electricity, are commonly called *electrometers*, and they are of four sorts : 1. The single thread ; 2. the cork or pith balls ; 3. the quadrant ; and, 4. the discharging electrometer. The second sort of electrometer, *i. e.* the cork-ball electrometer, was invented by Mr Canton ; the discharging electrometer was invented by Mr Lane, and hath been improved by Mr Henley ; another on a different principle by Mr Kinnerfley ; and the quadrant electrometer, which is of latest invention, is a contrivance of Mr Henley.

Besides the apparatus above described, there are several other instruments useful for various experiments ; but these will be described occasionally. The electrician, however, ought to have by him, not only a single coated jar, a single discharging rod, or, in short, only what is necessary to perform the common experiments ; but he should provide himself with several plates of glass, with jars of different sizes, with a variety of different instruments of every kind, and even tools for constructing them ; in order that he may readily make such new experiments as his curiosity may induce him to try, or that may be published by other ingenious persons who are pursuing their researches in this branch of philosophy.

§ 2. Description of the most useful Electrical Machines.

38
Description
of Doctor
Prieſtley's
machine.

Fig 2.

The first which may be mentioned is that described by Dr Prieſtley in his history of electricity ; which, on account of its extensive use, may be deservedly called a *universal electrical machine*.—The basis consists of two oblong boards *aa*, which are placed in a situation parallel to one another, about four inches asunder, and kept in that position by two pieces of wood adapted for the purpose. These boards, when set horizontally on a table, and the lowermost of them fixed with iron cramps, form the support of two perpendicular pillars of baked wood, and of the rubber of the machine. One of the pillars, together with the spring supports

ing the rubber, slides in a groove in a frame *a*, which reaches almost the whole length of the upper board ; and, by means of a screw, may be placed at any required distance from the pillar *b*, which is fixed, being put through a mortice in the upper board, and fastened to the lower. In these two pillars are several holes for the admittance of the spindles of different globes ; and as they may be situated at any distance from one another, they may be adapted to receive not only globes, but cylinders and spheroids of different sizes. " In this machine (says Dr Prieſtley), more than one globe or cylinder may be used at once, by fixing one above the other in the different holes of the pillars ; and by adapting to each a proper pulley, they may be whirled all at once, to increase the electricity." But this construction has one capital defect, that rubbers cannot be conveniently applied ; so that the power of several globes put together in this manner, though greater than one, is by no means equal to what it would be if the power of them all taken singly were united. Fig. 3. shows a machine of this kind contrived by Dr Watson.

The rubber ought to be made as above directed. It is supported by a socket which receives the cylindrical axis of a round and flat piece of glass or baked wood *g*, the opposite part of which is inserted into the socket of a bent steel spring *b*. These parts are easily separated, so that the rubber, or the piece of wood that serves to insulate it, may be changed at pleasure. The spring admits of a twofold alteration of position ; being capable of either slipping along the groove, or moving in the contrary direction, the groove being wider than the screw that fastens the spring, so as to give it every desirable position with regard to the globe or cylinder ; and it is besides furnished with a screw which makes it press harder or lighter as the operator chooses. The wheel of this machine is fixed to the table at *e*, and has several grooves for admitting more strings than one, in case that two or three globes or cylinders are used at a time ; and as it is disengaged from the frame of the machine, the latter may be screwed at different distances from the former, and so would be suited to the variable length of the string. The chain connected with the rubber at *n* is for making a communication with the table, when insulation is not wanted. The prime conductor is made of copper, hollow, and in the form of a pear ; having its neck placed upwards, and its bottom, or rounded part *k*, placed on a stand of glass or baked wood. An arched wire *l* proceeds from its neck, having an open ring at its end, in which some small pointed wires *m* are hung, that by playing lightly on the globe or cylinder collect the electric fluid from it.

Next to Dr Prieſtley's machine is one invented by Dr Ingenhouz, and which for its simplicity and convenience makes a fine contrast with the former.—This machine consists of a circular glass-plate about one foot diameter, which is turned vertically by a winch fixed to the iron axis that passes through its middle ; and it is rubbed by four cushions, each about two inches long, situated at the opposite ends of the vertical diameter. The frame consists of a bottom board, about a foot square, or a foot long and six inches broad, which, when the machine is to be used, may be fastened by an iron crank to the table. Upon this board two other slender and smaller ones are raised, which lie parallel

Apparatus.

29
Several
globes may
be made to
unite their
power in
this machine.

39
Of Dr Ingenhouz's

Apparatus. to one another, and are fastened together at their top by a small piece of wood. These upright boards support in their middle the axis of the plate, and to them the rubbers are fastened. The conductor is of hollow brass; and from its extremities branches are extended, which, coming very near the extremity of the glass, collect the electricity from it.

The power of this machine is perhaps more than a person would imagine by looking at it. It may be objected, that this construction will not easily admit of the rubbers being insulated, nor consequently be adapted to a great variety of experiments: but at the same time it must be allowed, that it is very portable, that it is not very liable to be out of order, and that it has a power sufficiently strong for physical purposes; on which account it may be conveniently used.

31
Mr Reid's
portable
machine.

Fig. 4. represents a very portable electrical machine invented by Mr Read, and improved by Mr Lane. *A* is the glass cylinder, moved vertically by means of the pulley at the lower end of the axis. This pulley is turned by a large wheel *B* which lies parallel to the table. There are three pulleys of different dimensions marked in the figure; one of which revolves four times for every revolution of the large wheel *B*. The conductor *C* is furnished with points to collect the fluid, and is screwed to the wire of a coated jar *D*, which stands in a socket between the cylinder and the wheel. The figure also represents the manner of applying Mr Lane's electrometer to this machine; of which an account shall be given afterwards.

Electrical machines have of late years undergone some very essential alterations and improvements; both from the suggestions of private electricians and the inventions of Messrs Adams, Nairne, and Jones, instrument makers of London. We shall subjoin a description of the most approved ones.

32
A machine
proper for
philosophi-
cal purpo-
ses.

Fig. 5. represents a most convenient machine for philosophical purposes, and whose power is equal to that of much larger ones of the old construction. The frame of this machine consists of the bottom board *A B C D*; which, when the machine is to be used, must be fastened to the table by two brass or iron cramps made for that purpose. Upon the bottom board there are two round pillars *E F* perpendicularly raised; which will best answer the purpose if made of baked wood. These serve to support the cylinder *G* by the axles of the brass or wood caps *H*. From one of these proceeds the long axle *I*, going through an hole in the pillar *F*; having a simple winch *J* fixed on its square end; or sometimes, as in fig. 6. below a pulley *L*. On the circumference of this pulley are several grooves in order to suit the variable length of the string *a*, which goes round one of them, as well as round the large multiplying wheel *A*. The other cap of the cylinder has a small cavity which fits the conical extremity of a strong screw proceeding from the pillar. The wheel *A*, which is moved by the handle, turns round a strong axle proceeding from about the middle of the same pillar. In small machines the simple winch may be adopted with great advantage, as is represented fig. 5. as not being liable to disorder; but in large ones the multiplying wheel is indispensably necessary.

In all these machines the rubber is composed of a cushion stuffed with horse-hair or flannel, fastened to a board behind. It is covered with red Basil leather; and

from its under edge, a piece of black Persian silk is glued, which goes over the cylinder as at *a*, fig. 5. to near the points of the collector fixed in the conductor. This a greater power of electricity is excited than what could have been done by the former machines. In them a piece of leather was fastened to the lower edge of the cushion, bearing against the cushion itself. To this piece of leather another of oiled silk was sewed, covering the cylinder as above described. In this way some of the amalgam above described was to be laid upon the piece of leather, and worked into its substance as much as possible; but in the present method nothing more is necessary than to hold an amalgamated piece of leather once or twice to the cylinder while turning. The rubber is fixed to a glass pillar *K* (fig. 5.) which is fastened into a wooden basis *L* at the bottom. This turns on a hinge; and by means of a screw at *M*, going through the basis to a fixed block on the frame, the pressure of the cushion may be augmented or diminished at pleasure; at the same time that it is rendered much more steady and uniform than by a flat sliding board and tightening screw as formerly used.

The glass pillar *K*, as well as all other glass pillars, the glass feet of insulating stools, &c. should be covered with varnish or rather sealing-wax; otherwise they will insulate very imperfectly on account of the moisture they attract from the air in damp weather. It was usual to support the rubber upon two springs screwed to its back, and which proceeded from the wooden cap of the pillar, in order to give way to and suit the inequalities of the glass; but by this contrivance the line of contact with the cylinder was not always the same, nor its pressure uniform, as already observed: but Mr William Jones has removed this difficulty by the bent spring represented fig. 1. It is fixed by a screw at *B*, and gives way by sliding notches at *a a*; its length and breadth are equal to that of the cushion, and its thickness proportional to the diameter and action of the cylinder upon it. In the machine above described, the rubber is well insulated, which is a great advantage when it is necessary to connect with the cushion a conductor, called the *negative conductor*; and when this happens not to be the case, which it usually is in making the common experiments, a chain with a small hook and ring may be hung to one end of the conductor, the other falling upon the table as in fig. 5.

The prime conductor belonging to this machine is represented by *N* in the same figure. It receives the electric fluid from the cylinder, and is usually made of brass or tin japanned. It is insulated by the glass pillar that supports it, and which is screwed into a wooden basis or foot. It is found more convenient to place the conductor parallel to the cylinder than with one of its ends towards it as was formerly done.

The handle of the wheel *A*, fig. 6. or the simple winch *J*, fig. 5. should be so turned, that the excited part of the cylinder may revolve from the rubber to the collecting points on the conductor; the prime conductor, standing then as in the figures, will be electrified positively, or overcharged with the electric fluid: for by the action of rubbing, the cylinder pumps, as it were, the fluid from the rubber, and every other body properly connected with it, and gives it to the
6 prime

Fig. 6.

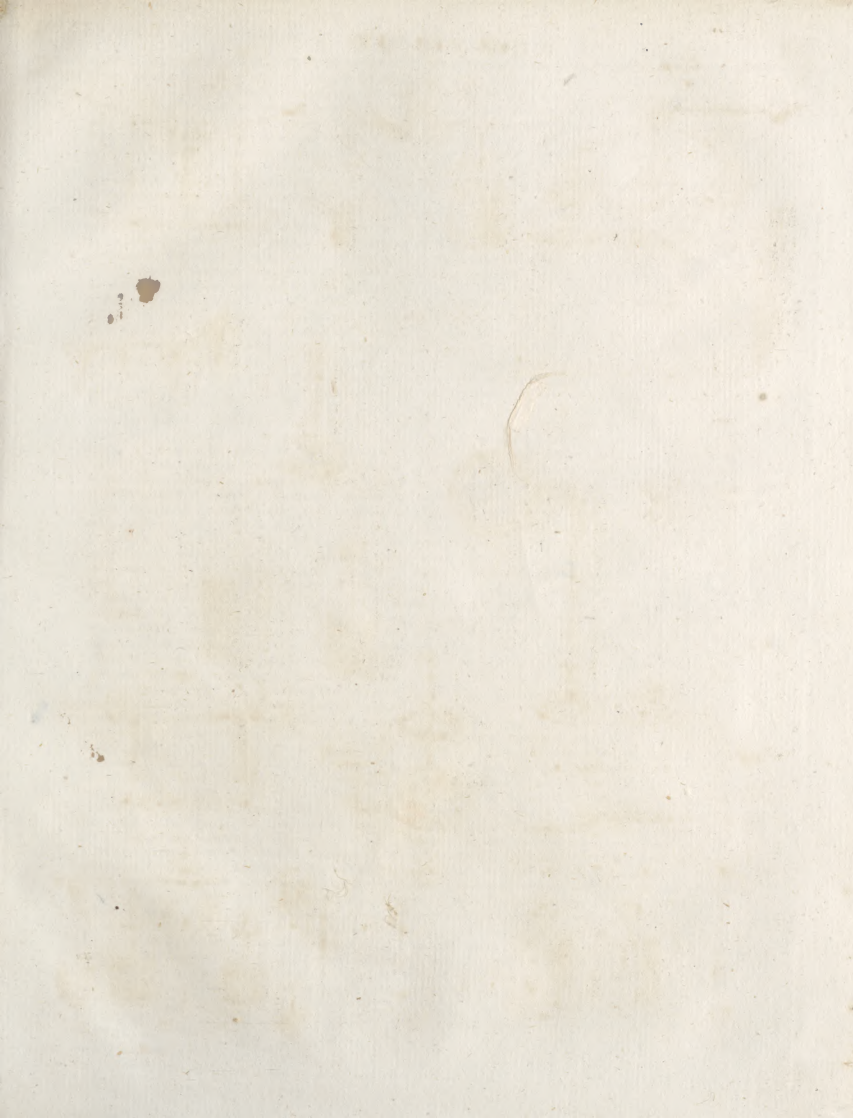


Fig. 11.

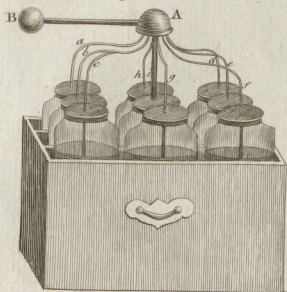


Fig. 10.



Fig. 9.



Fig. 8.



Fig. 14.



Fig. 13.

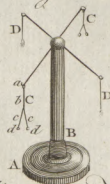


Fig. 12.

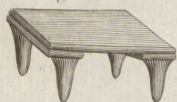


Fig. 17.



Fig. 16.

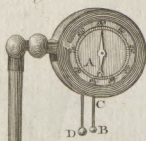


Fig. 22.



Fig. 23.



Fig. 28.



Fig. 21.



Fig. 27.

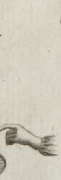


Fig. 28.

Fig. 20.

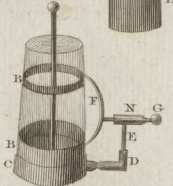


Fig. 19.



Fig. 18.



Fig. 15.

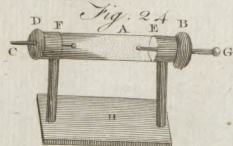
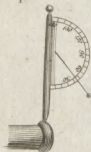


Fig. 24.

Fig. 26.

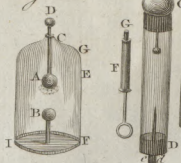


Fig. 25.



Apparatus. prime conductor. But if negative electricity be required, the chain must be removed from the rubber, and hung to the prime conductor: for in this case, the electricity of the prime conductor will be communicated to the ground, and the rubber remaining insulated will appear strongly negative. If another conductor, equal in size to *N*, be connected with the rubber, as strong negative electricity may be obtained from the one as positive electricity from the other.

33 Medical apparatus. Fig. 6. represents an electrical machine with a conductor in the shape of a *T*; and an improved medical apparatus, where it is necessary to give the shock in the arms, will be more particularly explained afterwards, under the article *MEDICAL ELECTRICITY*.

34 Mr Nairne's patent machine. Fig. 7. shows Mr Nairne's patent electrical machine for medical purposes. Its principal parts are the glass cylinder, generally about 7 inches in diameter and 12 in length, with the two conductors parallel to it. It is furnished with wooden caps, and turns in two wooden pieces cemented on the top of two strong glass pillars *BB*. These pillars are made fast into the bottom board of the machine, which is fastened to the table by means of a crank. There are grooves made in the under part of the bottom of the crank, through which the pieces *FF* slide. On these pieces the pillars stand by which the two conductors are supported; and in order to place these conductors nearer to the cylinder, or remove them farther from it, the pieces on which they stand are moveable outwards or inwards, and may be fixed by the two screw-nuts *LL*. The rubber is fastened to the conductor *R*; and consists of a cushion of leather stuffed, having a piece of silk glued to its under part. This last being turned over the surface of the cushion, and thus interposed between it and the glass, goes over the cylinder, and almost touches the pointed wires which are fixed on the other conductors for the purpose of collecting the electric fluid from the cylinder. The conductors are of tin covered with black lacker, each of them containing a large coated glass jar, and likewise a smaller one, or a coated tube, which are visible when the caps *NN* are removed. To each conductor is fixed a knob *O*, for the occasional suspension of a chain to produce positive or negative electricity. That part of the winch *C* which acts as a lever in turning the cylinder, is of glass. Thus every part of the machine is insulated, the cylinder itself and its brass caps not excepted; by which means the least quantity possible of electric fluid is dissipated, and hence of course the effects are likely to be the more powerful. And to this the inventor has adapted some flexible conducting joints, a discharging electrometer, and other utensils necessary for the practice of medical electricity.

35 Great machine at Teyler's museum. To these descriptions of electrical machines, we shall add that of a very large and powerful one in Teyler's Museum at Haarlem, and which was constructed by one Mr John Cuthbertson, an English mathematical instrument-maker. It consists of two circular plates of glass, each 65 inches in diameter, and made to turn upon the same horizontal axis, at the distance of $7\frac{1}{2}$ inches from one another. These plates are excited by eight rubbers, each 15½ inches long. Both sides of the plates are covered with a resinous substance to the distance of 16½ inches from the centre, both to render the plates stronger, and likewise to prevent any

of the electricity from being carried off by the axis. The prime conductor consists of several pieces, and is supported by three glass pillars 57 inches in length. The plates are made of French glass, as this is found to produce the greatest quantity of the electricity next to English flint, which could not be produced of sufficient size. The conductor is divided into branches which enter between the plates, but collect the fluid by means of points only from one side of the plate. The force of two men is required to work this machine; but when it is required to be put in action for any length of time, four are necessary. At its first construction nine batteries were applied to it, each having 15 jars, every one of which contained about a foot square of coated glass; so that the grand battery formed by the combination of all these contained 135 square feet. The effects of this machine were astonishing, as shall be mentioned in its proper place: but Dr Van Marum, who principally made experiments with it, imagining that it was still capable of charging an additional quantity of coated glass, afterwards added to it 90 jars of the same size with the former; so that it now contains a coated surface of 225 feet, and the effects are found to be proportionable.

We come now to describe some of the other parts of an electrical apparatus, and which, though not essentially necessary for exciting the property called *electricity*, are absolutely so for communicating it from one body to another, and performing many experiments which the machines themselves, however powerful, could not accomplish. Of these, the first we shall describe is that called the *discharger*; by which the electricity, whether positive or negative, collected upon one body, may be suddenly transferred from it to another; which is called *discharging* the electricity of the former, if only one body be perceptibly electrified; or of both, if the one contain positive and the other negative electricity.

36 Discharger of electricity. Fig. 8. represents Mr Henley's universal discharger; Plate an instrument of very extensive use in forming communications between jars or directing the shock through any particular substance. *AB* is a flat board 15 inches long, 4 broad, and 1 thick, and forming the basis of the instrument. *DC* are two glass pillars cemented in two holes upon the board *AB*, and furnished at their tops with brass caps; each of which has a turning joint, and supports a spring tube, through which the wires *EF* and *ET* slide. Each of these caps is composed of three pieces of brass, connected with each other in such a manner, that the wire *EF*, besides its sliding through the socket, has two other motions, viz. an horizontal one and a vertical one. Each of the wires is furnished with an open ring at one end, and at the other has a brass ball; which, by a short spring socket, is slipped upon its pointed extremity, and may be removed from it at pleasure. *HG* is a strong circular piece of wood five inches diameter, having a slip of ivory inlaid on its surface, and furnished with a strong cylindric foot, which fits the cavity of the socket *I*. This socket is fixed in the middle of the bottom board, and has a screw at *K*; by which the foot of the circular board is made fast at any required height.

Fig. 9. is a small press belonging to this instrument. It consists of two oblong pieces of wood, which

Apparatus which are forced together by the two screws *aa*. The lower end has a cylindrical foot equal to that of the circular table *H*. When this press is to be used, it must be fixed into the socket *I*, in place of the circular board *HG*; which in that case is to be removed.

37
Electrical jar or Leyden phial.
Fig. 10. shows an electrical jar or Leyden vial, for the purposes chiefly of giving a shock, or of accumulating a quantity of electricity in such a manner as could not be done in any other way, without using an immense extent of electrified surface. It is coated on the inside with tin-foil to the height of about three inches below the top of the cylindrical part of the glass; and having a wire with a round brass knob at its extremity, which passes through the middle of a piece of wood *D*, is used as a stopper for the bottle. Its lower end is usually connected with the inside coating by means of a piece of chain or slender wire.

38
Electrical battery.
Fig. 11. shows the most approved construction of an electrical battery; a part of the apparatus which takes its name from its construction and formidable effects. It consists of a number of coated jars, placed in such a manner that they may all be charged at the same time, and discharged in an instant; so that the whole power of electricity accumulated in them may be at once exerted upon the substance exposed to the shock. The battery represented in the figure consists of nine jars connected together by the wires *a, b, c, d, e, f, g, h, i*; all of which are fastened into the wood-stoppers of the bottles, and meet at top in the brass ball. Thus a communication is made between all the inside coatings of the jars, while their outside coatings are connected by the bottom of the box on which they stand; and which, that it may conduct the better, is covered with tin-foil. In one side of the box near the bottom is an hole through which a brass hook passes, and which communicates with the metallic lining of the box, and consequently with the outside coating of the jars. To this hook a wire or chain is occasionally connected when a discharge is made; and for the more convenient making of this discharge, a ball and wire *B* proceed to a convenient length from the centre ball *A*. When the whole force of the battery is not required, one, two, or three jars may be removed only by pressing down the wires belonging to them, until their extremities can slip out of their respective holes in the brass ball, and then turning them into such a posture that they cannot have any communication with the battery. The number of jars represented in this figure is rather small for some purposes; but it is better to join two or three small batteries together rather than have a single large one, which is inconvenient on account of its weight and unwieldiness.

The construction of jars and batteries is part of the business of an electrician; and he ought to be expert in coating the vials himself, not only because of the expense attending the employment of others, but because he may sometimes be at too great a distance from workmen who are accustomed to operations of this kind. A considerable difficulty arises with respect to the size of the jars and the kind of glass they are to be made of. Fine flint or crystal glass may probably be made use of with greater advantage than any other; but the expense here becomes a very considerable object, especially as the jars of a battery are

very apt to break by reason of the inequality of their strength; for it would seem that the force of the fluid in a battery is equally distributed among all the bottles, without any regard to their capacities of receiving a charge singly considered. Thus, if we express the quantity of charge which one jar can easily receive by the number 10, we ought not to combine such a jar in a battery with another whose capacity is only 8; because the whole force of electricity expressed by 10 will be directed also against that whose capacity is only 8; so that the latter will be in danger of being broken. It will be proper, therefore, to compare the bottles with one another in this respect before putting them together in a battery. Besides the consideration of the absolute capacity which each bottle has of receiving a charge, the time which is taken up in charging it must also be attended to; and the jars of a battery ought to be as equal as possible in this respect as well as in the former. The thinner a glass is, the more readily it receives a charge, and *vice versa*; but it doth not follow from thence, as electricians in general imagined till lately, that, on account of its thinness, it is capable of containing a greater charge than a thicker one. The reverse is actually the case: and though a thick glass cannot be charged in such a short time as a thin one, it is nevertheless capable of containing a greater power of electricity. If the thickness of the glass be very great, no charge can indeed be given it; but experiments have not yet determined how great the thickness must be which will prevent any charge. Indeed it is observed, that though a thick glass cannot be charged by a weak electric machine, it may be so by a more powerful one: whence it seems reasonable to suppose that there is no real limit of this kind; but that if machines could be made sufficiently powerful, glasses of any thickness might be charged. Mr Brookes, an ingenious electrician of Norwich, constructed his batteries, which appear to have been very powerful, of green-glass bottles. Some of them, like that represented in the figure, had only nine of these bottles; but when a greater power was wanted, more were added. Jars would have been preferred to bottles on account of their being more easily coated by reason of their wide mouths; but being less easily procured, he was content to put up with this inconvenience. The mean size of these bottles was about eight inches in diameter; they were coated 10 inches high, and made of the thickest and strongest glass that could be procured, weighing from five pounds and an half to seven pounds each. In the construction of a battery of 27 bottles, he disposed of them in three rows; nine of the stoutest and best composing the first row, nine of the next in strength being disposed of in the second, and the third containing the nine weakest. All of these were of green glass, but not of the same kind. Some which stood in the foremost row were composed of a kind very like that of which Frontinac wine-bottles are made: and our author remarks, that this kind of glass seems to be by much the best, as being both harder and stronger, and less liable to break by an high charge. The second and third rows of the battery consisted of bottles whose diameter was from six and an half to ten inches, and which were coated from eight and an half to eleven inches high; none of their mouths being larger than an

39
Why the jars of a battery are sometimes apt to break.

40
Mr. Brookes's method of constructing batteries.

Apparatus. an inch and an half, nor less than three quarters of an inch. In case any of the bottles being broken by the discharge of the battery, Mr Brookes found that it could be mended in such a manner as to become serviceable by a cement made according to the following receipt: "Take of Spanish-white eight ounces; heat it very hot in an iron ladle, to evaporate all the moisture; and when cool, sift it through a lawn sieve: add three ounces of pitch, three quarters of an ounce of rosin, and half an ounce of bees-wax: heat them all together over a gentle fire, stirring the whole frequently for near an hour; then take it off the fire, and continue the stirring till it is cold and fit for use." The bottles cemented with this composition, however, were not judged to be sufficiently strong to stand in their original place, but were removed to the second or third row, as it was apprehended they could best sustain the charge. All the bottles of this battery, as well as the single ones he commonly made use of in his experiments, were coated both on the inside and outside with slips of tin-foil from three-eighths to three-fourths of an inch wide, laid on with paste of flour and water, at the distance of about the breadth of a slip between each.

Fig. 12. represents the insulating stool, a very useful part of the apparatus, especially for medical purposes, where it is often necessary to insulate the human body. In these cases it is proper to have it of a magnitude sufficient to hold a chair or other seat, on which the patient may sit during the operation. The stool itself may be conveniently constructed of a mahogany board with glass feet varnished, as already directed. When in use, the insulation will be the more perfect that a piece of dry paper be put upon it.

These are the parts of the electrical apparatus essentially necessary for exhibiting the ordinary experiments; but as many very curious phenomena are to be observed in different substances, without using any part of the apparatus above described, we shall next proceed to give an account of those bodies which naturally exhibit signs of electricity, with the various phenomena attending them.

SECT. IV. A Catalogue of the different Electric Substances, with the general Phenomena attending their Excitation.

THE list of substances by which electric phenomena may be produced, is so very extensive, that it may perhaps be doubted whether all terrestrial matters, metals and charcoal only excepted, may not be included in the number. Some, however, have the property much more, or exhibit particular phenomena more obviously, than others; and according to this we may divide them into classes, as shall afterwards be more particularly noticed. The following catalogues enumerate those in which the property in general has been discovered.

Cavallot's
Electricity,
p. 17.

42
Catalogue
of electric
substances,
with their
different
powers.

Electric substances.	Quality of electricity.	Substances with which electric is rubbed.
The back of a cat.	Positive	{ Every substance hitherto tried. Every substance, except the back of a cat.
Smooth glass.	Positive	

Rough glass	Positive	Dry oiled silk, sulphur, or metals.
	Negative	Woollen-cloth, quills, wood, paper, sealing-wax, white-wax, the human hand.
Tourmalin	Positive	Amber, or air blown upon it.
	Negative	Diamond, the human hand.
Hare's skin	Positive	Metals, silk, loadstone, leather, hand, paper, baked wood.
	Negative	Other finer furs.
Black silk	Positive—Sealing-wax.	
	Negative	Hare's, weasel's, and ferret's skin, loadstone, brags, silver, iron, hand.
White silk	Positive	Black silk, metals, black cloth.
	Negative	Paper, hand, hare's, weasel's skin.
Sealing-wax	Positive—Metals.	
	Negative	Hare's, weasel's, and ferret's skin, hand, leather, woollen-cloth, paper.
Baked wood	Positive—Silk.	
	Negative—Flannel.	

Phenomena.

This table contains most of those substances that exhibit the strongest marks of electricity. The following is composed by Mr Henley, and contains a great number of substances whose electricity is much more equivocal. They were fixed or tied on the end of a stick of sealing-wax; and excited by friction against a woollen garment, or a piece of soft black silk, by which means they became electrified as below. The strongest in power are distinguished by the letter s, and the weakest by the letter w.

METALS.

A new guinea; a smooth sixpence; a brass ferule; tin, and tin-foil; enamelled copper, s; gilding on leather, s; lead ore; copper ore; iron ore; stream tin.	Wool.	Silk.
Milled lead; copper, s; a polished steel button, s; a new silver ditto; a metal button gilt, s; tutenague ditto, s; iron.	Neg.	Neg.
Lead from a tea-chest, in which there is a mixture of tin, w.	Pos.	Pos.
A gilt button, basket-pattern; the juncture at the end of a brass ferule.	Neg.	Neg.

ANIMAL SUBSTANCES.

Tortoise-shell, w; ivory, s; bone, s; horn; lamb's-tooth; horse's-hoof; deer's-hoof; muscle of the leg of a deer, s; cartilage, s; spur of a young cock; bill, claw, and scale from the leg of

Pheno-
mena.

of a turkey, s; scale of a carp; the *chrysalis* of a moth, recent from the earth, cleansed; *crassamentum* of the human blood exsiccated, w; quills; claw of an unboiled lobster; corrie and several other smooth shells, s; shell of a hen's egg; tail of a small fish; thigh of the elephant beetle; a small beetle, smooth surface; human hair; red and white horse's and bullock's hair, s; hog's bristles, s; wool; silk from the worm, w; oyster-shell, smooth surface;

Motlier of pearl, and several other shells.

Muscle and cockle-shells, recent; a recent snail-shell, rough surface; *elytra* of the stag-beetle; oyster-shell, rough surface.

VEGETABLES.

Rind of chestnut, s; Barcelona nut-shell, s; cashew nut, s; cocoa nut-shell polished; Brazil; *lignum vitæ*; black-bony, s; box, w; cane, s; *quinaquina*, or Peruvian bark, s; tamarind-stone; coffee-berry roasted, s; nutmeg, s; ginger, s; white pepper, freed from the hulk, s; cinnamon, s; cloves, s; mace, s; all-spice, s; capicum both sides of the pod, s; hemlock, s; a clove of garlic; ditto of eschalot, freed from the hulk, s; a green onion, s; rue, s; cork, s; leaves of laurel, bay, yew, holly, rosemary, with their berries, s; parsley, s; leaf of turnip; ditto of Savoy cabbage, s; celery, s; fago, s; thime, s; carrot; turnip; potato; an acorn, s; rind of Seville orange, s; a large Windfor bean, s; a white pea; root of the white lily; snow-drop root; seeds of gourd, melon, cucumber, w; a species of long moss, w; an apple, s; down of the cotton-rush, w; sea-flag; leaf of the American aloe, s; cotton, w.

Hemp; flax; stalk of the tobacco-leaf: spike, from the leaf of the American aloe; *palma-christi* nut; horse-radish.

A white kidney-bean, smooth surface; black negroe of the same; scarlet of the same.

CORALLINES.

Sea-fan, the horny part, w; rough coral, w.

Spunge, w; coral polished, w.

SALTS.

Alum, w.

Borax,

Nitre purified, }

Smooth surfaces;

FOSSIL AND MINERAL SUBSTANCES.

Common pebble-stones of all colours, s; marble, s; pit-coal, s; black-Nº 111.

Wool. Silk.

Pof. Pof.

Neg. Pof.

Neg. Neg.

Neg. Neg.

Neg. Pof.

Pof. Pof.

Neg. Pof.

Neg. Pof.

Neg. Neg.

Pof. Pof.

lead, w; jet, s; *asbestos*; mineralized sulphur; thunder-bolt stone; *cornu-ammonis*; shark's-tooth; coat of petrification.

Several smooth native crystals; brown Iceland ditto; *talc*, s; Ceylon pebble, smooth and transparent; agate, s; cornelian; amethyst, s.

A specimen of *gypsum*.

ARTIFICIAL SUBSTANCES.

Staffordshire ware glazed; China ware, s; Wedgwood's ware glazed, s; whale's fin prepared, w; writing-paper; parchment, s; sheep's gut.

Tobacco-pipe, s; Wedgwood's ware unglazed; elastic gum, s; hard under-crust of a leaf; a tallow-candle, w; oiled silk; painted paper, s; silver, burnt into glass, unburnished; pearl-barley, w; Indian ink, w; blue vitriol, s.

Dr Lewis's glass porcelain.

Here it must be observed, that a great number of the substances in Mr Henley's table, particularly metals, would have been totally incapable of excitation had they not been insulated; and as they were rubbed against electrics *per se*, it is by no means fair to conclude that the metal was excited. It seems much more likely that the rubber only was excited, and communicated its electricity to the metal. It must also be observed, that though there is a very remarkable difference between substances with regard to their non-electric or conducting power, yet there seems not to be a perfect electric in nature: for heat will destroy the electric power of glass, and every other substance; and, on the contrary, cold, if not attended with moisture, renders every electric substance more electric than before. The use of warming an electric therefore, before excitation, is only to free it from the moisture which may adhere to it.

From the above catalogues it will readily be apprehended, that the powers of the electric substances not only vary prodigiously from one another, but likewise according to the circumstances in which they are placed. Thus also we find, that, according to the different substances made use of, we may sometimes produce one phenomenon and sometimes another, in a manner exclusive of all the rest. Hence we have a foundation for classing electric substances according to the various powers they occasionally exhibit, and which we shall do in the following manner.

1. Those which exhibit a strong and permanent attractive and repulsive power; of which the most remarkable is silk.

2. For exhibiting the electric light, attraction and repulsion, and all the other phenomena of electricity in a very vigorous though not durable manner, glass is preferable to all other bodies.

3. Those which exhibit electric appearances for a great length of time, and which communicate to conducting bodies the greatest electric power. Of these the substances called *negative electrics* are the most remarkable;

Wool. Silk. Pheno-
mena.

Neg. Neg.

Pof. Pof.

Neg. Pof.

Pof. Pof.

Neg. Neg.

Neg. Pof.

Phenomena.

Phenomena.

markable; such as amber, gum-lac, rosin, sulphur, &c. on the properties of which depend the phenomena of the electrophorus, to be afterwards described.

4. Those which readily exhibit electrical phenomena by heating and cooling, of which the principal is the tourmalin.

§ 1. *Of the Electrical Phenomena from Silk.*

* See
m^o 5.

This substance was first discovered to be an electric by Mr Grey, in the manner we have already related*; but as it was by no means remarkable for emitting sparks, which most commonly engages the attention, its electric virtues were almost entirely overlooked till the year 1759. At that time Mr Symmer presented to the royal society some papers, containing a number of very curious experiments made with silk stockings, in substance as follows.

He had been accustomed to wear two pairs of silk stockings; a black and a white. When these were put off both together, no signs of electricity appeared; but on pulling off the black ones from the white, he heard a snapping or crackling noise, and in the dark perceived sparks of fire between them. To produce this and the following appearances in great perfection, it was only necessary to draw his hand several times backward and forward over his leg with the stockings upon it.

43
Strong attraction and repulsion between electrified stockings.

When the stockings were separated and held at a distance from each other, both of them appeared to be highly excited; the white stocking positively, and the black negatively. While they were kept at a distance from each other, both of them appeared inflated to such a degree, that they exhibited the entire shape of the leg. When two black or two white stockings were held in one hand, they would repel one another with considerable force, making an angle seemingly of 30 or 35 degrees. When a white and black stocking were presented to each other, they were mutually attracted; and if permitted, would rush together with surprising violence. As they approached, the inflation gradually subsided, and their attraction of foreign objects diminished, but their attraction of one another increased; when they actually met, they became flat, and joined close together like as many folds of silk. When separated again, their electric virtue did not seem to be in the least impaired for having once met; and the same appearances would be exhibited by them for a considerable time. When the experiment was made with two black stockings in one hand, and two white ones in the other, they were thrown into a strange agitation, owing to the attraction between those of different colours, and the repulsion between those of the same colour. This mixture of attractions and repulsions made the stockings catch at each other at greater distances than otherwise they would have done, and afforded a very curious spectacle.

When the stockings were suffered to meet, they stuck together with considerable force. At first Mr Symmer found they required from one to 12 ounces to separate them. Another time they raised 17 ounces, which was 20 times the weight of the stocking that supported them; and this in a direction parallel to its surface. When one of the stockings was turned inside out, and put within the other, it required 20 ounces to separate them; though at that time 10 ounces were sufficient when applied externally. Getting the black

stockings new dyed, and the white ones washed, and whitened in the fumes of sulphur, and then putting them one within the other, with the rough sides together, it required three pounds three ounces to separate them. With stockings of a more substantial make, the cohesion was still greater. When the white stocking was put within the black one, so that the outside of the white was contiguous to the inside of the black, they raised nine pounds wanting a few ounces; and when the two rough surfaces were contiguous, they raised 15 pounds one pennyweight and a half. Cutting off the ends of the thread and the tufts of silk which had been left in the inside of the stockings, was found to be very unfavourable to these experiments.

Mr Symmer also observed, that pieces of white and black silk, when highly electrified, not only cohered with each other, but would also adhere to bodies with broad and even polished surfaces, though these bodies were not electrified. This he discovered accidentally; having, without design, thrown a stocking out of his hand, which stuck to the paper-hangings of the room. He repeated the experiment, and found it would continue hanging near an hour. Having stuck up the black and white stockings in this manner, he came with another pair highly electrified; and applying the white to the black, and the black to the white, he carried them off from the wall, each of them hanging to that which had been brought to it. The same experiments held with the painted boards of the room, and likewise with the looking-glass, to the smooth surface of which both the white and the black silk appeared to adhere more tenaciously than to either of the former.

Similar experiments, but with a greater variety of circumstances, were afterwards made by Mr Cigna of Turin, upon white and black ribbons. He took two white silk ribbons just dried at the fire, and extended them upon a smooth plain, whether a conducting or electric substance was a matter of indifference. He then drew over them the sharp edge of an ivory ruler, and found that both ribbons had acquired electricity enough to adhere to the plain; though while they continued there, they showed no other sign of it. When taken up separately, they were both negatively electrified, and would repel each other. In their separation, electric sparks were perceived between them; but when again put on the plain, or forced together, no light was perceived without another friction. When by the operation just now mentioned they had acquired the negative electricity, if they were placed, not upon the smooth body on which they had been rubbed, but on a rough conducting substance, they would, on their separation, show contrary electricities, which would again disappear on their being joined together. If they had been made to repel each other, and were afterwards forced together, and placed on the rough surface above mentioned, they would in a few minutes be mutually attracted; the lowermost being positively, and the uppermost negatively electrified.

If the two white ribbons received their friction upon the rough surface, they always acquired contrary electricities. The upper one was negatively, and the lower one positively electrified, in whatever manner they were taken off. The same change was instantaneously done by any pointed conductor. If two ribbons, for instance, were made to repel, and the point

44
Experiments on ribbons by Mr Cigna.

of a needle drawn opposite to one of them along its whole length, they would immediately rush together.

The same means which produced a change of electricity in a ribbon already electrified, would communicate electricity to one which had not as yet received it; viz. laying the unelectrified ribbon upon a rough surface, and putting the other upon it; or by holding it parallel to an electrified ribbon, and presenting a pointed conductor to it. He placed a ribbon that was not quite dry under another that was well dried at the fire, upon a smooth plain; and when he had given them the usual friction with his ruler, he found, that in what manner soever they were removed from the plain, the upper one was negatively and the lower one positively electrified.—If both ribbons were black, all these experiments succeeded in the same manner as with the white. If, instead of the ivory ruler, he made use of any skin, or a piece of smooth glass, the event was the same; but if he made use of a stick of sulphur, the electricities were in all cases the reverse of what they had been before the ribbons were rubbed, having always acquired the positive electricity. When he rubbed them with paper either gilt or not gilt, the results were uncertain. When the ribbons were wrapped in paper gilt or not gilt, and the friction was made upon the paper laid on the plain above mentioned, the ribbons acquired both of them the negative electricity. If the ribbons were one black and the other white, whichever of them was laid uppermost, and in whatever manner the friction was made, the black generally acquired the negative and the white the positive electricity.

He also observed, that when the texture of the upper piece of silk was loose, yielding, and retiform like that of a stocking, so that it could move and be rubbed against the lower one, and the rubber was of such a nature as could communicate but little electricity to glass, the electricity which the upper piece of silk acquired did not depend upon the rubber, but upon the body on which it was laid. In this case, the black was always negative and the white positive. But when the silk was hard, rigid, and of a close texture, and the rubber of such a nature as would have imparted a great degree of electricity to glass, the electricity of the upper piece depended on the rubber. Thus, a white silk stocking rubbed with gilt paper upon glass became negatively, and the glass positively, electrified. But if a piece of silk of a firmer texture was laid upon a plate of glass, it was *always* electrified positively, and the glass negatively, if it was rubbed with sulphur, and for the most part if it was rubbed with gilt paper.

If an electrified ribbon was brought near an insulated plate of lead, it was attracted, but very feebly. On bringing the finger near the lead, a spark was observed between them, the ribbon was vigorously attracted, and both together showed no signs of electricity. On the separation of the ribbon, they were again electrified, and a spark was perceived between the plate and the finger.

When a number of ribbons of the same colour were laid upon a smooth conducting substance, and the ruler was drawn over them, he found, that when they were taken up singly, each of them gave sparks at the place where it was separated from the other, as did also the

last one with the conductor; and all of them were negatively electrified. If they were all taken from the plate together, they cohered in one mass, which was negatively electrified on both sides. If they were laid upon the rough conductor, and then separated singly, beginning with the lowermost, sparks appeared as before, but all the ribbons were electrified positively, except the uppermost.—If they received the friction upon the rough conductor, and were all taken up at once, all the intermediate ribbons acquired the electricity, either of the highest or lowest, according as the separation was begun with the highest or the lowest. If two ribbons were separated from the bundle at the same time, they clung together, and in that state showed no sign of electricity, as one of them alone would have done. When they were separated, the outermost one had acquired an electricity opposite to that of the bundle, but much weaker.

A number of ribbons were placed upon a plate of metal to which electricity was communicated by means of a glass globe, and a pointed conductor held to the other side of the ribbons. The consequence was, that all of them became possessed of the electricity opposite to that of the plate, or of the same, according as they were taken off; except the most remote, which always kept an electricity opposite to that of the plate.

§ 2. Of the Phenomena produced by excited or electrified Glass.

THAT glass is an electric substance, was first discovered by Dr Gilbert. It was for a long time, however, thought to possess but a very weak electric virtue; though now it is found to be one of the best, if not the very best, electric as yet known. Notwithstanding the many experiments made upon this substance, it is not yet ascertained what kind of glass is most proper for electrical purposes. It has been observed, that the hardest and most completely vitrified glass is often a very bad electric, being sometimes quite a conductor. Glass vessels made for electrical purposes are often rendered fit for them by use and time, though very bad electrics when new. Mr Bergman of Upsal says, that very often, when his glass globes could not be excited to a sufficient degree of strength, he lined them with a thin coating of sulphur, and that then they gave a much stronger positive electricity than before. In Italy, and other places, according to Mr Nollet, it is the custom of electricians to put a coating of pitch or other resinous matter on the inside of their globes, which they say always makes them work well. He gives the preference to the crystal glass of England, Bohemia, &c. It seems doubtful, however, whether the common bottle glass does not answer equally well, or even better.

The most remarkable phenomenon producible by excited glass is that of the Leyden ⁴⁶vial. It depends entirely upon the following property of glass, viz. that it is impossible to electrify the outside of a glass positively, at least to any considerable degree, without at the same time electrifying the inside of it negatively; in like manner, it is impossible to electrify the outside negatively; without at the same time electrifying the inside positively. It is also the nature of glass and all other electric substances, when once electrified either by excitation or communication,

⁴⁵ All kinds of glass not equally proper for electric experiments.

⁴⁶ Leyden explained.

Phenomena.

Phenomena.

munication, to part with their electricity very slowly and gradually. Thus, supposing a tube, cylinder, or plate of glass, to be highly electrified; if a finger is brought near any part of it, a spark will be felt to strike the finger with a snapping noise. Part of the electricity will then be discharged from the glass, but not all. If the finger is brought near another part of the glass, a similar spark will be again produced; and so on, by moving the finger to different parts of the glass, till all its electricity is exhausted. It is the nature of conducting substances to discharge all their electricity at once, by a single spark, if another conducting substance is brought near them. This being the case, therefore, it follows, that if every part of one side of a glass plate is covered over with a conducting substance, every point of the glass will give out its electricity to the conductor; and consequently, if another conducting substance is brought near to that by which the glass is covered, the whole electric power in the glass ought to be discharged in one single flash or large spark.

This would no doubt be the case, if it was possible to electrify the glass only on one side. But this is found to be impossible. No method hath yet been found of electrifying one side of a piece of glass positively, without electrifying the other negatively at the same time. There is therefore a necessity for taking off the electricity from both sides of the glass at the same time. This can only be done by covering both sides of the glass with a conducting substance, and presenting other conductors to both sides at the same time: then the electricity of both is discharged in an instant. A strong spark is perceived between both sides of the coated glass and the conducting substances; and if a person holds one in each hand, he will, at the instant of the discharge, feel a very disagreeable sensation, which cannot well be described, in his arms and breast; and this is said to be receiving the *electric shock*.

If, instead of presenting a conducting substance to both sides of the plate at once, a finger is presented to one side, suppose that which is positively electrified, and another substance very highly electrified positively is presented to the negative side of the glass, a like discharge will ensue, but the shock will be much gentler than in the former case, and probably the electricity of the glass will not be all discharged. If two conducting substances, insulated, suppose two cylinders of metal fixed upon sticks of sealing wax, or suspended by silk threads, are brought to the sides of the coated glass at the same time; each of them will receive a spark of positive or negative electricity, according as the side to which it was applied is positively or negatively electrified. When the metallic cylinders are taken away, they will communicate the electricity they have received to other bodies; and if again applied to the coated glass, they will receive sparks as before; and thus the electricity of both sides will be gradually discharged.

After the discharge has been once made, the glass is found in a short time to recover its electricity, tho' in a small degree. The side which was originally electrified positively, becomes electrified in the same manner the second time, and so of the negative side. This second electrification is called the *residuum* of a charge; and, where there is a large surface of coated glass, hath a very considerable degree of power. The same thing,

which we have just now observed with regard to a flat surface of glass, takes place with tubes and vials, or glass vessels of any kind; and it is always observed, that the thinnest glass answers best for this purpose. The Leyden vial consists of a glass vial, jar, or bottle, covered on the outside and inside with tin-foil, yet leaving an interval of two or three inches at top without any metallic covering, that the electricity of the one side may not be communicated to the other as fast as it is collected. A more particular description of it will be given when we speak of the electric apparatus. The above will be sufficient to render the following experiments intelligible.

Mr Symmer, when making the experiments we have already related, concerning the strong cohesive power of electrified silk, was induced to try the cohesive power of electrified glass. For this purpose, he got two panes of common window-glass, the thinnest and smoothest he could meet with. He coated one of the sides with tin-foil, leaving a space uncovered near the edges. The uncovered sides were then put together, and electricity communicated to one of the coatings by means of a machine. In consequence of this, the other side, which was also coated, became electrified with an electricity opposite to the first, and both panes were charged with the electric power, as if they had been but one. After they had received a considerable degree of electric power, they cohered pretty strongly together, but he had no apparatus by which the strength of their cohesion could be measured. He then turned the plates upside down; and discharging from his machine positive electricity upon the negative side of the glass, both panes were immediately discharged, and their cohesion ceased. Placing two panes of glass, each of them coated on both sides, one upon the other, each of them had a positive and negative side, by communicating electricity to one of them, and they did not cohere.

In consequence of these experiments made by Mr Symmer, and another (which we shall presently give on account of) made at Pekin, Mr Beccaria made the following ones. Having charged a coated plate of glass, he took off the coating from the negative side, and applied another uncoated and uncharged (or un-electrified) plate of glass close to it. After this, putting a coating upon the uncharged glass (so that the whole resembled one coated plate consisting of two laminæ), he made a communication between the two coatings. The consequence of this was an explosion, a discharge of the positive and negative electricity, and a cohesion of the plates. If the plates were separated before the explosion, after they had been in conjunction for some time, the charged plate was positive on both sides, and the uncharged one negative on both sides. If after the explosion he separated and joined them alternately, a small circle of paper, placed under the uncharged plate, adhered to it upon every separation, and was thrown off again upon every conjunction. This could be repeated even 500 times with once charging the plate. This is the experiment made at Pekin as above mentioned.

If, in these experiments, the charged plate was inverted, and the positive side applied to the uncharged plate, all the effects were exactly the reverse of the former. If it was inverted ever so often, after remain-

ing some time in contact with the uncharged plate, it would produce a change in the electricity. In the dark, a light was always seen upon the separation of these plates. Laying the two plates together like one, and coating the outsides of them, he discharged them both together; and at the distance of about four feet he distinguished six of the coloured rings mentioned by Sir Isaac Newton, all parallel to one another, and nearly parallel to the edge of the coating. At the angles of the coatings the rings spread to a greater distance. Where the coatings did not quite touch the glass, the rings bent inwards; and where the coatings adhered very close, they retired farther from them. Upon discharging these two plates, the coloured rings vanished, and the electric cohesion ceased with them. On separating the plates before the explosion; that which had received the positive electricity was positive on both sides, and the other negative on both sides. If they were separated after the explosion, each of them was affected in a manner quite the reverse. Upon inverting the plates, that which was the thinner appeared to be possessed of the stronger electricity, and brought the other plate to correspond with it. Charging the two plates separately, and taking off two of the coatings, so that two positive or two negative sides might be placed together, there was no cohesion nor explosion. But joining a positive and a negative side, they immediately cohered; and a communication being formed on the outside, there was an explosion which increased the cohesion.

Mr Henley repeated these experiments with success when he made use of plates of looking-glass, or window and crown glass; but when two plates of Nuremberg glass, commonly called *Dutch plates*, were used, the result was very different. Each of the plates, when separated after charging, had a positive and a negative surface. When they were replaced, and a discharge made, by forming a communication between the two coatings, the electricity of all the surfaces was changed. It appeared, however, still to be very strong; and the plates continued to give repeated flashes of light when they were alternately closed, touched, and separated, like the other plates above-mentioned. If a clean, dry, uncoated plate of looking-glass was placed between the coated plates, either of looking-glass or crown-glass, before they were charged, that uncoated plate was always found, upon separating them after charging, to be electrified negatively on both sides; but if it was put between the Dutch plates, it acquired, like them, a positive and negative electricity.

The following observation of Mr Æpinus is very remarkable. He pressed close together two pieces of looking-glass, each containing some square inches; and found, that when they were separated, and not suffered to communicate with any conductor, they acquired a strong electricity, the one positive and the other negative. When put together again, the electricity of both disappeared; but not if either of them had been deprived of their electricity when they were asunder; for in that case, the two, when united, had the electricity of the other.

These are the most remarkable experiments that have been made with electrified flat plates of glass. Tubes

of the same matter, however, afford a variety of curious phenomena of a different nature. One very remarkable one is the conducting power of new flint-glass, which is most easily perceived in tubes, and on which Dr Priestley makes the following observations. He several times got tubes made two or three yards long, terminating in solid rods. These he took almost warm from the furnace, in the finest weather possible; and having immediately insulated them, perceived that the electricity of a charged vial would presently diffuse itself from one end to the other; and this he thought would have been the case at any distance at which the experiment could have been made. When the same tubes were a few months older, the electricity could not be diffused along their surface farther than half a yard.

The diffusive power of glass he thought proper to try in a different manner. A tube was procured of about three feet long, but of very unequal width. About three inches of the middle part of it were coated on both sides. This coated part was afterwards charged, by communicating electricity to the inside of it by means of a wire. The consequence of this was, that not only the part through which the wire was introduced became strongly electrical on the outside, but at the opposite end, where there was neither coating nor wire, the fire crackled under the fingers as the tube was drawn through the hand, and a flame seemed continually to issue out at both ends, while it was at rest and charged. One end of this tube was broken and rough, the other was smooth.

Another tube was procured about three feet and an half in length, and very thin. It was about an inch in diameter, and closed at one end. Three inches of it were coated on both sides, about nine inches below the mouth. This part being charged, the whole tube, to the very extremity of it, was strongly electrical, crackling very loud when the hand was drawn along it, and emitting sparks at about an inch distance all the way. After drawing the whole tube through the hand, all the electricity on the outside was discharged; but, on putting a finger into the mouth, a light streamed from the coating, both towards the finger and towards the opposite end of the tube. After this, all the outside of the tube was become strongly electrical as before; and this electricity might be taken off and recovered many times without charging the tube anew, only it was weaker each time.—Holding this tube by the coated part, and communicating electricity to the uncoated outside, both sides became charged; and, upon introducing a wire, a considerable explosion was made. The discharge made the outside strongly electrical, and by taking off this electricity, the tube became sensibly charged. The residuum of these charges was very considerable; and, in one tube, there was a residuum after 20 or 30 discharges.

By being kept for six or seven months, most of the tubes employed in these experiments lost the above-mentioned properties, and the electricity could no longer diffuse itself upon their surfaces. At length they were all broken except one, which had been the most remarkable of the whole. With this old tube, the Doctor tried to repeat the above-mentioned experi-
ments.

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By Mr
Henley.

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Conducting
power of
glass tubes.

Phenomena.

Phenomena.

ments; but to no purpose. He then took it to a glass-house; and having made it red all over, its diffusive property was restored as before.

He then tried two other tubes which had been made about six weeks, but without being used during all that time, and they answered exactly as if they had been quite new. The charge from a small coated part diffused itself all over the tube; so that, at the distance of a yard from the coating, it gave sparks to the finger of an inch long. On this occasion he observed, that when his finger was brought to the tube about two inches above the coating, a great quantity of the diffusing electricity was discharged; and his whole arm was violently shocked. The old tube, after being heated as above mentioned, showed a prodigious diffusive power. Upon charging a small coated part, the electricity was diffused to the end of the tube; and it gave sparks at the distance of an inch over every part of it. When it was drawn through the hand, in order to take off the diffused electricity, it instantly returned again, and the extremity of the tube would be highly electrified, even while its communication with the coating was cut off by the hand. The middle part of the tube also, which had been oftenest heated, had a much greater diffusive power than any other. It was no sooner taken off, than it appeared again; so that it gave a continual stream of fire. The quantity of residuum after a discharge of this tube was prodigious; so that the outside coating would immediately after give almost a constant stream of fire for some time to any conducting substance placed near it.

The Doctor also observed, that in all the tubes which had the diffusion, there was a considerable noise at the orifice when his hand was drawn from the extremity towards the coating, as if the tube had been gradually discharging itself. In the dark, the electric matter seemed perpetually to pour from the open end, or both ends if they were open; and whenever his hand was drawn over it, the fire streamed from the coating to his hand in a very beautiful manner. The first time he charged any of these tubes after they had stood a while, the diffusion was the most remarkable. It was lessened by every successive charge, and at last became exceedingly small; but after the tube had stood a few hours uncharged, it was as vigorous as ever.

Mr Cavallo hath also made some curious discoveries concerning glass-tubes. He took the hint from observations with glass tubes accidentally, that by agitating quicksilver in a glass tube hermetically sealed, and in whose cavity the air was very much rarefied, the outside of the tube was sensibly electrified. The electricity, however, was not constant, nor in proportion to the agitation of the quicksilver. In order to ascertain the properties of these tubes, he constructed several of them, one of which is represented fig. 71. Its length was 31 inches, and its diameter something less than half an inch. The quicksilver contained in it was about three fourths of an ounce; and in order to exhaust it of air, one end of it was closed, while the quicksilver boiled in the other. Before this tube is used, it must be made a little warm and cleaned; then, holding it nearly horizontal, the quicksilver in it is suffered to run from one end to the other, by gently and alternately elevating and depressing its extremities. This operation immediately renders the outside electrical; but with the

following remarkable property, viz. that the end of the tube where the quicksilver actually stands is always positive, and all the remaining part of it negative. If elevating this positive end of the tube a little, the quicksilver runs to the opposite end which was negative, then the former instantly becomes negative, and the latter positive. The positive end has always a stronger electricity than the negative. If when one end of the tube, for instance *A*, is positive, i. e. when the quicksilver is in it, that electricity is not taken off by touching it; then, on elevating this end *A*, so that the quicksilver may run to the opposite end *B*, it appears negatively electrified in a very small degree. If by depressing it again it is a second time rendered positive, and that positive electricity is not taken off, then, on elevating the end *A* again, it appears positive in a small degree. But if, whilst it is positive, its electricity is taken off, then on being elevated, it appears strongly negative. When about two inches of each extremity of this tube is coated with tin-foil, as represented in the figure, that coating renders the electricities at the extremities more perceptible, so that sometimes they will give sparks to a conductor brought near them. Tubes whose glass is about one-twentieth of an inch thick answer better for these experiments than any others.

We shall close this account of the phenomena of excited glass, with some experiments which show the durability of the electric virtue in that substance in certain circumstances. Mr Canton procured some thin glass balls of about an inch and a half in diameter, with stems or tubes of eight or nine inches in length. He electrified them, some positively, and others negatively, on the inside, and then sealed them hermetically. Soon after, he found that they had lost all signs of electricity: but holding them to the fire at the distance of five or six inches, they became strongly electrical in a short time, and more so as they cooled. Heating them frequently he found would diminish their power; but keeping one of them under water a week did not appear in the least to impair it. That which he kept under water was charged on the 22d of September 1760, was heated several times before it was kept in water, and had been frequently heated afterwards; yet it still retained its virtue to a considerable degree till the 31st of October following. The breaking of two of his balls gave him an opportunity of observing their thickness, which he found to be between seven and eight parts of a thousand of an inch. The balls retained their virtue for six years, but in a less degree. Mr Lullin also found, that a glass tube charged and hermetically sealed, would show signs of electricity when heated.

The most remarkable instances of the continuance of this power in glass, however, are those given by Mr Henly in the 67th volume of the Phil. Trans. One is, of a small bottle, which showed signs of electricity for 70 days after it had been charged, and stood in a cupboard all that time. The other is of a glass cylinder, which after excitation continued to show very strong signs of electricity from the 5th day of February to the 10th of March, though various methods had been used during that time to destroy the electric virtue. These means always proved effectual when they were applied, and the cylinder for some time

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Durability
of the elec-
tric virtue
in glass.

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Cavallo's
experi-
ments with
glass tubes.

Plate
CLXXVII.

showed.

showed no signs of electricity. They never failed, however, to return without any fresh excitation; and became stronger and weaker, nay, sometimes quite vanished and returned, without any visible cause. In general, the electricity was weak when a fire was kept in the room, or when the door was kept open. When the wind blew from the north, the electricity was vigorous, and likewise after it had been for some time destroyed by flame. The cylinder, however, did not at all times retain its electric virtue for such a length of time without excitation. Very often it would lose all signs of electricity in 12 hours, and at other times in a fortnight, without returning till it was again excited.

§ 3. *The Phenomena of excited Sulphur, Gum-lac, Amber, Resin, baked Wood, &c.*

THE most remarkable property of these, as already mentioned, is the durability of their electric virtue when once excited. They are also capable of being excited by heat without any friction. This last property was discovered by Mr Wilcke, who distinguishes it by the name of *spontaneous electricity*. He melted sulphur in an earthen vessel, which he placed upon conductors: then, letting them cool, he took out the sulphur, and found it strongly electrical; but it was not so when it stood to cool upon electric substances. He then melted sulphur in glass vessels, whereby they both acquired a strong electricity whether placed upon electrics or not; but a stronger in the former case than in the latter: they acquired a stronger virtue still, if the glass vessel was coated with metal. In these cases, the glass was always positive and the sulphur negative. It was particularly remarkable, that the sulphur acquired no electricity till it began to cool and contract, and was the strongest in the greatest state of contraction; whereas the electricity of the glass was, at the same time, the weakest; and was the strongest of all when the sulphur was shaken out before it began to contract, and acquired any negative electricity.

Pursuing experiments of this kind, he found, that melted sealing-wax poured into glass acquired a negative electricity, but poured into sulphur a positive one, leaving the sulphur negative. Sealing-wax also, poured into wood, was negative, and the wood positive; but sulphur poured into sulphur, or into rough glass, acquired no electricity at all.

Similar experiments were also made by Mr Æpinus. He poured melted sulphur into metal cups; and observed, that, when the sulphur was cold, the cup and sulphur together showed no signs of electricity, but very strong signs of it the moment they were separated. The electricity always disappeared when the sulphur was replaced in the cup, and revived upon its being taken out. The cup had acquired a negative, and the sulphur a positive electricity; but if the electricity of either of them had been taken off while they were separate, they would both, when united, show signs of that electricity which had not been taken off.

Mr Wilcke also made several curious experiments concerning the effects of different rubbers upon electric substances, the most remarkable of which is the following: viz. that sulphur rubbed against metals was

always positive; and this was the only case in which it was so. But, being rubbed against lead, it became negative, and the metal positive.

With regard to the perpetual attractive power of sulphur, &c. which Mr Grey fancied he had discovered*, the most remarkable example he gives is of a large cone of stone sulphur, covered with a drinking glass in which it was made. This he said would never fail to show an attractive power when the glass was taken off. In fair weather, the glass would attract also; but not so strongly as the sulphur, which never failed to attract, let the wind or weather be ever so variable. This experiment has been repeated by Mr Henly; who says he has never known the sulphur to fail of showing signs of electricity on the removal of the glass. Gum-lac, resin, &c. agree in the same general properties with sulphur, but do not become so strongly electrified spontaneously, nor are they so easily excited.

§ 4. *Phenomena of the Tourmalin.*

THESE have been accurately observed by Dr Priestley, who gives the following account of the methods he made use of for that purpose.

1. To ascertain the kind of electricity produced, he had always at hand a stand of baked wood with four ^{Dr Priestley's method of observing its electricity.} arms projecting from it. Three of these were of glass, having threads of fine silk as it comes from the worm fastened to them, and at the end of each thread a small piece of down. From the other arm hung a fine thread about 9 or 10 inches long, while a brass arm suspended a pair of pith-balls. At the other extremity of this arm, which was pointed, a jar could be placed, to receive the electricity, and by the repulsive power of it keep the balls equally diverging with positive or negative electricity; or sometimes he suspended the balls in an uninsulated state within the influence of large charged jars; and lastly, he had always a fine thread of trial at hand, by which he could discover whether the stone was electrical or not before he began his experiments.

2. Before he began any experiments on the stone, also, he never failed to try how long the fine threads, which he used as electrometers, would retain their virtue; and found this to be various in various cases. When the threads would retain their electric virtue for a few minutes, he preferred them; but when this was not the case, he had recourse to the feathers, which never failed to retain it for several hours. They might be touched without any sensible loss of power, though they received their virtue very slowly. In the experiments now to be related, he made use of Dr Heberden's large tourmalin, whose convex side became positive and the flat side negative in cooling; and in all of them, when the positive or negative side of the tourmalin is mentioned, it is to be understood that which is positive or negative in cooling.

3. From Mr Wilcke's experiments on the production of spontaneous electricity, by melting one substance within another, he first conjectured that the tourmalin might collect its electricity from the neighbouring air: To determine which the following experiment was made. Part of a pane of glass was laid on the standard bar of an excellent pyrometer, and upon that glass the tourmalin was placed. This bar was heated

Phenomena.

Phenomena.

heated by a spirit lamp, so that the increase or decrease of heat in the tourmalin could thus be exactly determined. In this situation he observed, that whenever he examined the tourmalin, the glass had acquired an electricity contrary to that side of the stone which lay upon it, and equally strong with it. If, for example, the flat side of the stone had been presented to a feather electrified positively, as the heat was increasing, it would repel it at the distance of about two inches, and the glass would attract it at the same or a greater distance; and when the heat was decreasing, the stone would attract, and the glass repel it at the distance of four or five inches. The case was the same whichever of the sides was presented, as well as when a shilling was fastened with sealing-wax upon the glass; the electricity both of the shilling and glass being always opposite to that of the stone. When it came to the turn, the electricity was very quickly reversed; so that in less than a minute the electricity would be contrary to what it was before. In some cases, however, viz. where the convex surface of the tourmalin was laid upon the glass or shilling, both of these became positive as well as the stone. This he supposed to be owing to the stone touching the surface on which it lay only in a few points, and that its electricity was collected from the air; which supposition was verified: for, getting a mould of Paris plaster made for the tourmalin, and heating it in the mould, fastened to a slip of glass, he always found the mould and glass possessed of an electricity contrary to that of the stone, and equally strong with it. During the time of cooling, the mould seemed to be sometimes more strongly negative than the stone was positive; for once, when the stone repelled the thread at the distance of three inches, the mould attracted it at the distance of near six (A).

4. On substituting another tourmalin instead of the piece of glass; it was observed, that when one of the tourmalins was heated, both of them were electrified, as much as the tourmalin and glass had been. If the negative side of a hot tourmalin was laid upon the negative side of a cold one, the latter became positive, as would have been the case with a piece of glass. On heating both the tourmalins, though fastened together by cement, they acquired the same power that they would have done in the open air.

5. As the tourmalins could not in this case touch in a sufficient number of points, it was now thought proper to vary the experiment by cooling the tourmalin in contact with sealing-wax, which would fit it with the utmost exactness. On turning the stone, when cold, out of its waxen cell, it was found positive, and the wax negative; the electricity of the stone being thus contrary to what would have happened in the open air. The other side, which was not in contact with the wax, acquired the same electricity that it would have done though the stone had been heated in the open air; so that both sides now became positive. In like manner the positive side of the stone, on being cooled in wax, became negative.

6. On attempting to ascertain the state of the different sides of the tourmalin during the time it was heating in wax, many difficulties occurred. It was found impossible in these cases to know exactly when the stone begins to cool; besides, that in this method of treatment it must necessarily be some time in the open air before it can be presented to the electrometer; and the electricity of the sides in heating is by no means so remarkable as in cooling. In the experiments made with the tourmalin, when its positive side was buried in wax, it was generally found negative, though once or twice it seemed to be positive. On cooling it in quicksilver contained in a china cup, it always came out positive, and left the quicksilver negative; but this effect could not be concluded to be the consequence of applying the one to the other, because it is almost impossible to touch quicksilver without some degree of friction, which never fails to make both sides strongly positive though it be quite cold, and especially if the stone be dipped deep into it. At last, supposing that the stone would not be apt to receive any friction by simple pressure against the palm of the hand, he was induced to make the experiment, and found it fully to answer his expectations; for thus, each side of the stone was affected in a manner directly contrary to what would have happened in the open air.

7. Fastening the convex side of the large tourmalin to the end of a stick of sealing-wax, and pressing it against the palm of the hand, it acquired a strong negative electricity, contrary to what would have happened in the open air. Thus it continued till it had acquired all the power it could receive by means of the heat of the hand; after which it began to decrease, though it continued sensibly negative to the very last. On allowing the stone to cool in the open air, its negative power constantly increased till it became quite cold.

8. On heating the same flat side by means of a hot poker held near it, and then just touching it with the palm of the hand when so hot that it could not be borne for any length of time, it became positive. Letting it cool in the air it became negative, and on touching it again with the hand it became positive; and thus it might be made alternately positive and negative for a considerable time. At last, when it became so cool that the hand could bear it, it acquired a strong positive electricity, which continued till it came to the same degree of heat.

9. The wax was removed from the convex, and fastened to the flat side of the stone; in which circumstances it became weakly positive after receiving all the heat the hand could give it. On letting it cool in the open air it grew more strongly positive, and continued so till it was quite cold; and thus the same side became positive both with heating and cooling.

10. On heating the convex side by means of a poker, and pressing it against the palm of the hand as soon as it could be borne, it became pretty strongly negative; though it is extremely difficult to procure any appearance

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(A) This would probably have been found always the case; for here the stone and mould acted in a manner similar to the electrophorus and its metal plate; the latter of which always discovers a greater electric power than the former.

Phenomena.

ance of negative electricity from this side; and care must be taken that a slight attraction of the electrified feather, by a body not electrified, be not mistaken for negative electricity.

11. On covering the tourmalin when hot with oil and tallow, no new appearances were produced; nor did the heating of it in boiling oil produce any other effect than lessening the electricity a little; and the event was the same when the tourmalin was covered with cement made of bees-wax and turpentine. On making a small tourmalin very hot, and dropping melted sealing-wax upon it, so as to cover it all over to the thickness of a crown piece, it was found to act through this coating nearly, if not quite, as well as if it had been exposed to the open air. Thus a pretty deception may be made; for if a tourmalin be inclosed in a stick of wax, the latter will seem to have acquired the properties of the stone.

12. On letting the stone cool in the vacuum of an air-pump, its virtue seemed to be diminished about one half, owing no doubt to the vacuum not being sufficiently perfect.

13. On fixing a thin piece of glass opposite and parallel to the flat side of the tourmalin, and about a quarter of an inch distance from it, in an exhausted receiver, the glass was so slightly electrified, that it could not be distinguished whether it was positive or negative.

13. On laying the stone upon the standard bar of the pyrometer, and communicating the heat to it by means of a spirit lamp, it was extremely difficult to determine the nature of the electricity while the heat was increasing to 70°; during which time the index of the pyrometer moved about one 7200th part of an inch. But if the stone was taken off the bar, and an electrified thread or feather presented to that side which had lain next it, the convex side was always negative, and the flat one positive.

14. To determine what would be the effect of keeping the tourmalin in the very same degree of heat for a considerable time together, it was laid upon the middle of the bar, to which heat was communicated by two spirit lamps, one at each extremity; and making the index move 45 degrees, it was kept in the same degree for half an hour without the least sensible variation; and it was observed, that the upper side, which happened to be the convex one, was always electrified in a small degree, attracting a fine thread at the distance of about a quarter of an inch. If in that time it was taken off the bar, though ever so quick, and an electrified feather presented to it, the flat side, which lay upon the bar, was negative, and the upper side very slightly positive, which appeared only by its not attracting the feather. On putting a piece of glass between the stone and standard bar, keeping it likewise in the same degree of heat, and for the same space of time as before, the result was the same; the glass was slightly electrified, and of a kind opposite to that of the stone itself. To avoid the inconvenience of making one side of the stone hotter than another, which necessarily took place when it was heated on the pyrometer, the following method was used. By means of two rough plates which happened to be in the stone, it was tied with a silk thread which touched only the extreme edge of it; and thus being perfectly insulated, it might be held at any distance from a candle, and heated to what degree was thought

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Phenomena.

necessary; while, by twisting the string, it was made to present its sides alternately, and thus the heat was rendered very equal in both. After being made in this manner so hot that the hand could scarce bear it, it was kept in that situation for a quarter of an hour. Then, with a bundle of fine thread held for some time before in the same heat, the electricity which it had acquired by heating was taken off, and it was found to acquire very little if any; when appeared the justness of an observation of Mr Canton's, that it is the change of heat, and not the degree of it, that produces the electric property of this stone.

15. On heating the stone suddenly, it may sometimes be handled and pressed with the fingers several times before any change takes place in the electricity which it acquires by heating, though it begins to cool the moment it is removed from the fire. In this case, however, the stone must be heated only to a small degree. When the heat is three or four times as great as is sufficient to change the electricity of the two sides, the virtue of the stone is the strongest, and appears to be so when it is tried in the very neighbourhood of the fire. In the very centre of the fire the stone never fails to cover itself with ashes attracted to it from every quarter; whence it acquired its name in Dutch.

16. The tourmalin often changes its electricity very slowly; and that which it acquires in cooling never fails to remain many hours upon it with very little diminution. It is even possible, that in some cases the electricity acquired by heating may be so strong as to overpower that which is acquired by cooling; so that both sides may show the same power in the whole operation. "I am very certain (says the Doctor), that in my hands both the sides of Dr Heberden's large tourmalin have frequently been positive for several hours together, without any appearance of either of them having been negative at all. At this time I generally heated the tourmalin, by presenting each side alternately to a red hot poker, or a piece of hot glass, held at the distance of about half an inch, and sometimes I held it in the focus of a burning mirror; but I have since found the same appearance when I heated it in the middle of an iron hoop made red hot. The stone in all these cases was fattened by its edge to a stick of sealing-wax. This appearance I have observed to happen the oftener when the iron hoop has been exceedingly hot, so that the outside of the stone must have been heated some time before the inside; and I also think there is the greatest chance of producing this appearance, when the convex side of the stone is made the hotter of the two. When I heat the large tourmalin in this manner, I seldom fail to make both sides of the stone positive till it be about blood-warm. I then generally observe a ragged part of the flat side towards one end of the stone become negative first, and by degrees the rest of the flat side; but very often one part of the flat side will, in this method of treatment, be strongly positive half an hour after the other part is become negative."

SECT. V. *Of the different Theories of Electricity, with the principal Experiments brought in favour of each, and which tend more particularly to show the Nature of the Electric Fluid.*

It is not to be supposed, that the phenomena of elec-

Theory. electricity would long be observed without attempts to account for them. In fact, this was attempted by Thales, who first observed the attractive power of amber. At this property he was so much surprised, that he reckoned the amber to be *animated*. With regard to the sentiments of Theophrastus on this subject, we are entirely in the dark; but, among the succeeding electricians, all the phenomena were derived from *unctuous effluvia* emitted by the excited electric. These were supposed to fasten upon all bodies in their way, and to carry back with them all that were not too heavy. For, at that time, effluvia of every kind were supposed to return to the bodies from which they were emitted; since nobody could otherwise account for the subsistence not being sensibly waited by the constant emission. When these light bodies on which the unctuous effluvia had fastened were arrived at the excited electric, a fresh emission of the effluvia was supposed to carry them back again. But this effect of the effluvia was not thought of till electric repulsion, as well as attraction, had been fully observed.

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Electric phenomena ascribed to unctuous effluvia.

The discovery of a difference between conducting and non-conducting substances, threw considerable difficulties in the way of those who maintained the hypothesis of unctuous effluvia. When the Newtonian philosophy began to be pretty generally received, the terms *attraction* and *repulsion* were quickly introduced into electricity, as well as other branches of philosophy; and the electric effluvia, instead of being of an *unctuous* nature, were said to be of an attractive or repulsive one. At the same time, the apparent stop which is put to the progress of these effluvia by any electric substance, introduced a question not yet well decided, viz. Whether electric bodies are penetrable by the fluid or not?

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Two electric fluids supposed by Mr du Fay.

When Mr Du Fay discovered the two opposite species of electricity, at that time distinguished by the names of *vitreous* and *resinous*, and afterwards by those of *plus* and *minus*, or positive and negative, he formed the idea of two distinct electric fluids. Both these were supposed to have a *repulsive* power with respect to themselves, but an *attractive* one with regard to one another.

As long as electrical attraction and repulsion were the only phenomena to be accounted for, this theory served the purpose well enough. To account for attraction and repulsion by an *attractive* and *repulsive* power, was indeed no explication at all; but it afforded a change of terms, which is too frequently mistaken for an explanation both in electricity and other parts of philosophy.—At last, however, Mr Du Fay dropped his opinion concerning the existence of two electric fluids, and thought that all the phenomena might be accounted for from the action of a single one. The vitreous or positive electricity, which was supposed to be the stronger, he thought might attract the negative, or weaker electricity.—It is indeed true, that, in many experiments, the positive electricity doth manifest a superiority in strength over the negative, something like that superior degree of vigour which is observed in one of the poles of a loadstone over the other. According to Mr Du Fay's own principles, however, had this been the case, a body positively electrified ought to have attracted one electrified negatively more

weakly than one not electrified at all; which is contrary to experience.

During all this time, it was imagined, that the electric matter, whether it consisted of one or more fluids, was produced from the electric body by friction; but by a discovery of Dr Watson's, it became universally believed, that the glass globes and tubes that served only to set the fluid in motion, but by no means to produce it. He was led to this discovery by observing, that, upon rubbing the glass tube, while he was standing upon cakes of wax or rosin (in order, as he expected, to prevent any discharge of the electric matter upon the floor), the power was, contrary to his expectation, so much lessened, that no snapping could be observed upon another person's touching any part of his body; but that, if a person not electrified held his hand near the tube while it was rubbed, the snapping was very sensible. The event was the same when the globe was whirled in similar circumstances. For, if the man who turned the wheel, and who, together with the machine, was suspended upon silk, touched the floor with one foot, the electric fire appeared upon the conductor; but if he kept himself free from any communication with the floor, little or no fire was produced.—He observed, that only a spark or two would appear between his hand and the insulated machine, unless he at the same time formed a communication between the conductor and the floor; but that then there was a constant and copious flux of the electric matter observed between them. From these, and some other experiments of a similar kind, the Doctor discovered what he called the *complete circulation* of the electric matter. When he found, that, by cutting off the communication of the glass globe with the floor, all electric operations were stopped, he concluded, that the electric fluid was conveyed from the floor to the rubber, and from thence to the globe. For the same reason, seeing the rubber, or the man who had a communication with it, gave no sparks but when the conductor was connected with the floor, he as naturally concluded, that the globe was supplied from the conductor, as he had before concluded that it was supplied from the rubber. From all this he was at last led to form a new theory of electricity, namely, that, in electric operations, there was both an *efflux* of electric matter to the globe and the conductor, and likewise an *efflux* of the same electric matter from them. Finding that a piece of leaf-silver was suspended between a plate electrified by the conductor, and another communicating with the floor, he reasons from it in the following manner. "No body can be suspended in equilibrium but by the joint action of two different directions of power: so here the blast of electric ether from the floor setting through it, drives the silver towards the plate electrified. We find from hence, likewise, that the draught of electric ether from the floor is always in proportion to the quantity thrown by the globe over the gun-barrel (the prime conductor at that time made use of), or the equilibrium by which the silver is suspended could not be maintained." Some time after, however, the Doctor retracted this opinion concerning the afflux and efflux, and supposed that all the electric phenomena might be accounted for from the excess or diminution of the quantity of electric matter

Theory.
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Electric matter discovered to come from the earth.

58
Dr Watson's theory of afflux and efflux.

^{Theory.} contained in different bodies. This theory was afterwards adopted by Dr Franklin, and continues to be generally received.

⁵⁹ Difficulty concerning the direction of the electric fluid. One great difficulty with which the first electricians were embarrassed (and which is yet scarcely removed), was to ascertain the direction of the fluid. At first, all electric powers, as we have already observed, were supposed to reside in the excited globe or glass tube. The electric spark therefore was imagined to proceed from the electrified body towards any conductor that was presented towards it. It was never imagined there could be any difference in this respect, whether it was amber, glass, sealing-wax, or any thing else that was excited. This progress of the electric matter was thought to be quite evident to the senses; and therefore the observation of electric appearances at an insulated rubber occasioned the greatest astonishment.— In this case, the current could not be supposed to flow both from the rubber and the conductor, and yet the first appearances were the same. To provide a supply of the electric matter, therefore, philosophers were obliged to suppose, that, notwithstanding appearances were in both cases much the same, the electric fluid was really emitted in one case by the electrified body, and received by it in the other. But now being obliged to give up the evidence from sight for the manner of its progress, they were at a loss, whether, in the usual method of electrifying by excited glass, the fluid proceeded from the rubber to the conductor, or from the conductor to the rubber. It was, however, soon found, that the electricity at the rubber was the reverse of that at the conductor, and in all respects the same with that which had before been produced by the friction of sealing-wax, sulphur, resin, &c. Seeing, therefore, that both the electricities were produced at the same time, by one and the same electric, and by the same friction, all philosophers were naturally led to conclude, that both were modifications of one fluid; though in what manner that fluid was modified throughout the immense variety of electric phenomena, was a matter not easy to be determined.

⁶⁰ Abbe Nollet's theory.

On this subject, the Abbe Nollet adopted the doctrine of *afflux* and *efflux* already mentioned. He supposed, that, in all electrical operations, the fluid is thrown into two opposite motions; that the *afflux* of this matter drives all light bodies before it by impulse upon the electrified body, and its *efflux* carries them back again. He was, however, very much embarrassed in accounting for facts where both these currents must be considered; as in the quick alternate attraction and repulsion of light bodies by an excited glass tube, or other excited electric. To obviate this difficulty, he supposes that every excited electric, and likewise every body to which electricity is communicated, has two orders of pores, one for the emission of the *effluvia*, and another for the reception of them. Mr de Tour improved upon Nollet's hypothesis, and supposed that there is a difference between the *affluent* and *effluent* current; and that the particles of the fluid are thrown into vibrations of different qualities, which makes one of these currents more copious than the other, according as sulphur or glass is used. It is impossible, however, that suppositions so very arbitrary could be at all satisfactory, or received as proper solutions of the electric phenomena.

^{Theory.} No less difficult was it for philosophers to determine the nature of the electric fluid, than its manner of acting. It had been in a manner generally believed, that *fire* was not a distinct element, but arose from some violent repulsions, rarefactions, &c. among the particles of ignited bodies. The great resemblance of the electric fluid to elementary fire, how-ever, seemed strongly to militate against this opinion. The hypothesis therefore of fire as a distinct principle or element began to revive. Some maintained, that the electric fluid was really this principle; others thought that it was a fluid *sui generis*, very much resembling that of fire; while others, with Mr Boulanger at their head, imagined that it was nothing more than the finer parts of the atmosphere, which crowded upon the surfaces of electric bodies, when the grosser parts had been driven away by the friction of the rubber.

This last opinion, however, soon received a full refutation from the experiments of Dr Waston above-mentioned; by which it was proved, that the electric matter came not from the atmosphere, but from the earth. About the same time the Leyden phial was discovered; and the extraordinary effects of it rendered the inquiries into the nature of the electric fluid much more general than before. But still, the violent prejudice against the existence of fire as a real element or fluid distinct from terrestrial bodies, continued in its full vigour, and the most extravagant theories were acquiesced in, rather than the simple position above mentioned. It would be tedious, and indeed impossible, to give an account of all the theories which were now invented. One of the most remarkable, and most consistent, was that of Mr Willon. According to this gentleman, the chief agent in all the operations of electricity, is Sir Isaac Newton's ether; which is more or less dense in all bodies in proportion to the smallness of their pores, except that it is much denser in sulphureous and mucinous bodies. To this ether are ascribed the principal phenomena of attraction and repulsion: the light, the sulphureous or rather phosphoreal smell with which violent electricity is always attended, and other sensible qualities, are ascribed to the grosser particles of bodies driven from them by the forcible action of this ether. He also endeavours to explain many electrical phenomena by means of a subtle medium at the surface of all bodies; which is the cause of the refraction and reflection of the rays of light, and also resists the entrance and exit of this ether.

⁶¹ Different opinions concerning the nature of the electric fluid. This medium, he says, extends to a small distance from the body, and is of the same nature with what is called the *electric fluid*. On the surface of conductors this medium is rare, and easily admits the passage of the electric fluid; whereas, on the surface of electrics, it is dense and resists it. The same medium is rarefied by heat, which thus changes conductors into non-conductors. By far the greater number of philosophers, however, rejected the opinion of Mr Willon; and as they neither chose to allow the electric fluid to be *fire* nor *ether*, they were obliged to own that it was a fluid *sui generis*, i.e. one of whose nature they were totally ignorant.

But while philosophers were thus embarrassed in their electrical theories, a vast number of interesting phenomena were discovered by the assiduity of a number of different electricians in different countries. Mr Winckler observed, that if glass was rubbed on the inside,

⁶² Mr Willon's theory.

Theory.

Theory.

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Great
power of e.
lectricity
excited by
some philo-
sophers.

fide, it would show strong appearances of electricity on the outside ; which seemed to favour the opinion of the permeability of glass to the electric matter. Other German electricians used several globes at a time, and imagined they found effects proportionable ; tho' this has since been found a mistake. Such a prodigious force, however, could they excite by means of these globes whirled by a large wheel, and rubbed by the hand or with woollen cloth, that, according to their own accounts, blood could be drawn from a finger by means of the electric spark, the skin would burst, and a wound appear as if made by a caustic. If several globes or tubes were used, they said, that the motion of the heart and arteries would be very perceptibly increased in such as were electrified ; and that, if a vein was opened in these circumstances, the blood issuing from it would appear like lucid phosphorus, and run out faster than when the person was not electrified. Mr P. Gordon, a Scots Benedictine monk, and professor of philosophy at Erfurd, increased the electric sparks to such a degree, that they were felt from a man's head to his foot, so that he could hardly take them without falling down with giddiness, and small birds were killed by them. This was effected by conveying the electricity with iron wires to the distance of 200 ells from the place of excitation. He also found that the sparks were stronger when the wires were thick than when they were small.

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Electric
fluid found
to act ac-
cording to
the large-
ness of elec-
trified sur-
face.

While the power of electricity was thus tried, another question of great importance was likewise decided, namely, Whether electricity acted according to the largeness of the surface of bodies ? This was found to be in proportion to the surface, and not the solid contents. The magnetic effluvia also were found not to interfere in the least with the electrical ones. An electrified loadstone attracted light bodies of all kinds by its electric virtue, at the same time that it attracted iron and steel by its peculiar magnetic virtue. The attractive virtue of electricity was also found to pervade glass so powerfully, that a thread was attracted through five exhausted receivers, and seemingly with more vigour than it would have been by the excited tube alone in the open air.

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Dr Franklin's
theory.

Such was the state of philosophical opinions concerning electricity, when Dr Franklin first invented his theory concerning positive and negative, or *plus* and *minus*, electricity. This had been already suggested by Dr Watson, but was not so fully explained by him as by Dr Franklin ; on which account the latter is generally reckoned to be the sole inventor. According to this theory, all the operations in electricity depend upon one fluid *sui generis*, extremely subtle and elastic. Between the particles of this fluid there subsists a very strong repulsion with regard to each other, and as strong an attraction with regard to other matter. Thus, according to Dr Franklin's hypothesis, one quantity of electric matter will repel another quantity of the same, but will attract and be attracted by any terrestrial matter that happens to be near it. The pores of all bodies are supposed to be full of this subtle fluid ; and when its equilibrium is not disturbed, that is, when there is in any body neither more nor less than its natural share, or than that quantity which it is capable of retaining by its own attraction, the fluid does not manifest itself to our senses. The action of the

rubber upon an electric disturbs this equilibrium, occasioning a deficiency of the fluid in one place, and a redundancy of it in another. This equilibrium being forcibly disturbed, the mutual repulsion of the particles of the fluid is necessarily exerted to restore it. If two bodies be both of them overcharged, the electric atmospheres repel each other, and both the bodies recede from one another to places where the fluid is less dense. For as there is supposed to be a mutual attraction between all bodies and the electric fluid, such bodies as are electrified must go along with their atmospheres. If both the bodies are exhausted of their natural share of this fluid, they are both attracted by the denser fluid existing either in the atmosphere contiguous to them, or in other neighbouring bodies ; which occasions them still to recede from one another as if they were overcharged.

This is the Franklinian doctrine concerning the cause of electric attraction and repulsion ; but it is evident, that the reason just now given why bodies negatively attracted ought to repel one another, is by no means satisfactory. Dr Franklin himself had framed his hypothesis before he knew that bodies negatively electrified would repel one another ; and when he came afterwards to learn it, he was surprised, and acknowledged that he could not satisfactorily account for it. * Other philosophers therefore invented different solutions of this difficulty, of which that above mentioned is one. But by some this was rejected. They said, that as the denser electric fluid, surrounding two bodies negatively electrified, acts equally on all sides of those bodies, it cannot occasion their repulsion. The repulsion, according to them, is owing rather to an accumulation of the electric on the surfaces of the two bodies ; which accumulation is produced by the attraction, and the difficulty the fluid finds in entering them. This difficulty is supposed chiefly to be owing to the air on the surface of bodies, which Dr Priestley says is probably a little condensed there. This he deduces from an experiment of Mr Wilson, corrected by Mr Canton. The experiment was made in order to observe the course of the electric light through a Torricellian vacuum. A singular appearance of light was observed upon the surface of the quicksilver, at which the fluid was supposed to enter. Mr Wilson supposed that this was owing to a subtle medium spread over the surface of the quicksilver, and which prevented the easy entrance of the electric fluid. But this was afterwards discovered by Mr Canton to be owing to a small quantity of air which had been left in the tube. It is plain, however, that as the attraction is equal all round, and likewise the difficulty with which the fluid penetrates the air, bodies negatively electrified ought not to repel one another on this supposition more than the former. Nay, they ought to attract each other ; because, in the place of contact, the resistance of the air would be taken off, and the electric fluid could come from all other quarters by the attraction of the bodies.

Mr Cavallo, who seems to have undertaken the defence of this hypothesis in all cases, gives another reason why bodies negatively electrified should repel each other. In a chapter intitled, " A Compendious View of the principal properties of Electricity," among others he gives the following : " No electricity can be

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Difficulty
concerning
the reason
why bodies
negatively
repel one
another.
* Franklin's
Letters.
67
Different
solutions
of this dif-
ficulty.

68
Mr Cavallo's
solution.

Theory.

observed upon the surface of any electrified body, except that surface is contiguous to an electric, which electric can some how or other acquire a contrary electricity at a little distance. Otherwise:—No electricity can appear upon the surface of any electrified body, except that surface is opposite to another body which has actually acquired the contrary electricity, and these contrarily electrified bodies are separated by an electric. On considering this principle (adds he), it may be asked, Why an electricity can be observed upon the surface of an electrified body that is insulated at a considerable distance from other conductors? Or, Which is the electric that is contiguous to the surface of an electrified conductor or excited electric, and which has actually acquired a contrary electricity at a little distance from the said surface? To this question it is answered, that the air is, in general, the electric which is opposite to the surface of any electrified body; which, not being a perfect conductor, does easily acquire a contrary electricity on a stratum of its substance that is at a little distance from the electrified body; and, in consequence of this stratum, it acquires another stratum contrarily electrified, and at a little distance from the former: to this other strata succeed, alternately possessed of positive and negative electricities, and decreasing in power till they vanish. This assertion is easily proved by several experiments, particularly the following. If the end of a pretty long glass tube be presented to a body electrified, for instance, positively, the tube will be found electrified positively also for the space of one or two inches at that end; but beyond that space, will be found two or three inches electrified negatively: after that another positive electricity will appear; and so alternately, a positive and a negative zone will follow one another, always weaker and weaker in power, till at last they quite vanish. This shows, that, in general, when an electric sufficiently dense is presented to an electrified body, it acquires successive zones or strata of positive and negative electricity."

From this fact (which, with the utmost impropriety, he terms a *law* of electricity, whereas it is most evidently the *effect* of a law, and not the law itself), Mr Cavallo gives the following reason why bodies negatively electrified repel one another. "As to the repulsion existing between bodies possessed of the same electricity; in order to understand its explanation thoroughly, the reader must be reminded of the principle above-mentioned, which is, that no electricity, *i. e.* the electric fluid proper to a body, can either be augmented or diminished upon the surface of that body, except the said surface is contiguous to an electric, which can acquire a contrary electricity at a little distance: from whence it follows, that no electricity can be displayed upon the facing surfaces of two bodies that are sufficiently near to one another, and both possessed of the same electricity; for the air that lies between those contiguous surfaces has no liberty of acquiring any contrary electricity. This being premised, the explanation of electric repulsion becomes very easy. Suppose, for instance, that two small bodies are freely suspended by insulated threads; so that, when they are not electrified, they may hang contiguous to one another. Now suppose these bodies to be electrified either positively or negatively, and then they must repel one

Theory.

another: for either the increased or the diminished natural quantity of electric fluid in these bodies will endeavour to diffusive itself equally over every part of the surfaces of these bodies; and this endeavour will cause the said bodies to recede from each other, so that a quantity of air may be interposed between their surfaces, sufficient to acquire a contrary electricity at a little distance from the said surfaces. Otherwise: If the bodies possessed of the same electricity do not repel each other, so that a sufficient quantity of air may be interposed between their surfaces, the increased quantity of electric fluid when the bodies are electrified positively, or the remnant of it when they are electrified negatively, by the above principle cannot be diffused equally throughout or over the surfaces of these bodies; for no electricity can appear upon the surfaces of bodies in contact, or that are very near each other. But the electric fluid, by attracting the particles of matter, endeavours to diffuse itself equally throughout or over the surfaces of these bodies; therefore the said bodies are, by this endeavour, forced to repel one another."

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This theory is evidently no solution of the difficult. Insufficient. ty; seeing it is only explaining one fact by another, which requires explanation at least as much as the first. But though this should be overlooked, it is still insufficient; for, granting that bodies negatively electrified ought to repel one another till the electricity is equally diffused along their surfaces, yet when this is accomplished, the repulsion ought to cease. Now, there is no occasion for supposing the bodies to be electrified while they are in contact, or nearly so. One may be electrified negatively in one corner of a room, and another in the other. The electrification may also be continued for any length of time we please, so that it is not possible to suppose but the electric matter must have diffused itself equally along the surfaces of both: yet, if we attempt to bring these bodies together, we shall find that they will repel each other very violently; which ought not to be the case, according to Mr Cavallo's supposition.

What gave the greatest reputation to Dr Franklin's ⁷⁰Franklin's theory, however, is the easy solution which it affords ^{Dr Franklin's} explanation of all the phenomena of the Leyden phial. The fluid nation of is supposed to move with the greatest ease in bodies ^{the phenomena of the} which are conductors, but with extreme difficulty in Leyden ^{phial.} *electric per se*; inasmuch that glass is absolutely impermeable to it. It is moreover supposed, that all electricities, and particularly glass, on account of the smallness of their pores, do at all times contain an exceeding great, and always an equal quantity of this fluid; so that no more can be thrown into any one part of any electric substance, except the same quantity go out at another, and the gain be exactly equal to the loss. These things being previously supposed, the phenomena of charging and discharging a plate of glass admit of an easy solution. In the usual manner of electrifying by a smooth glass globe, all the electric matter is supplied by the rubber from all the bodies which communicate with it. If it be made to communicate with nothing but one of the coatings of a plate of glass, while the conductor communicates with the other, that side of the glass which communicates with the rubber must necessarily be exhausted in order to supply the conductor, which must convey the whole of it to the

side

Theory.

Theory.

fide with which it communicates. By this operation, therefore, the electric fluid becomes almost entirely exhausted on one side of the plate, while it is as much accumulated on the other; and the discharge is made by the electric fluid rushing, as soon as an opportunity is given it by means of proper conductors, from the side which was overloaded to that which is exhausted.

It is not, however, necessary to this theory, that the very same individual particles of electric matter which were thrown upon one side of the plate, should make the whole circuit of the intervening conductors, especially in very great distances, so as actually to arrive at the exhausted side. It may be sufficient to suppose, that the additional quantity of fluid displaces and occupies the space of an equal portion of the natural quantity of fluid belonging to those conductors in the circuit which lay contiguous to the charged side of the glass. This displaced fluid may drive forwards an equal quantity of the same matter in the next conductor; and thus the progress may continue till the exhausted side of the glass is supplied by the fluid naturally existing in the conductors contiguous to it. In this case, the motion of the electric fluid, in an explosion, will rather resemble the vibration of the air in sounds, than a current of it in winds.

It will soon be acknowledged (says Dr Priestley), that while the substance of the glass is supposed to contain as much as it can possibly hold of the electric fluid, no part of it can be forced into one of the sides, without obliging an equal quantity to quit the other side: but it may be thought a difficulty upon this hypothesis, that one of the sides of a glass plate cannot be exhausted, without the other receiving more than its natural share; particularly, as the particles of this fluid are supposed to be repulsive of one another. But it must be considered, that the attraction of the glass is sufficient to retain even the large quantity of electric fluid which is natural to it, against all attempts to withdraw it, unless that eager attraction can be satisfied by the admission of an equal quantity from some other quarter. When this opportunity of a supply is given, by connecting one of the coatings with the rubber, and the other with the conductor, the two attempts to introduce more of the fluids into one of the sides are made, in a manner, at the same instant. The action of the rubber tends to disturb the equilibrium of the fluid in the glass; and no sooner has a spark quitted one of the sides, to go to the rubber, than it is supplied by the conductor on the other; and the difficulty with which these additional particles move in the substance of the glass, effectually prevents its reaching the opposite exhausted side. It is not said, however, but that either side of the glass may give or receive a small quantity of the electric fluid, without altering the quantity on the opposite side. It is only a very considerable part of the charge that is meant, when one side is said to be filled while the other is exhausted.

It is a little remarkable, adds Dr Priestley, that the electric fluid, in this and in every other hypothesis, should so much resemble the ether of Sir Isaac Newton in some respects, and yet differ from it so essentially in others. The electric fluid is supposed to be, like e-

ther, extremely subtle and elastic, that is, repulsive of itself; but instead of being, like the ether, repelled by all other matter, it is strongly attracted by it: so that, far from being, like the ether, rarer in the small than in the large pores of bodies, rarer within the bodies than at their surfaces, and rarer at their surfaces than at any distance from them; it must be denser in small than in large pores, denser within the substance of bodies than at their surfaces, and denser at their surfaces than at a distance from them.

To account for the attraction of light bodies, and other electrical appearances, in air of the same density with the common atmosphere, when glass (which is supposed to be impermeable to electricity) is interposed; it is conceived, that the addition or subtraction of the electric fluid, by the action of the excited electric on one side of the glass, occasions, as in the experiment of the Leyden phial, a subtraction or addition of the fluid on the opposite side. The state of the fluid, therefore, on the opposite side being altered, all light bodies within the sphere of its action must be affected in the very same manner as if the effluvia of the excited electric had actually penetrated the glass, according to the opinions of all electricians before Dr Franklin.

This hypothesis has been in some measure improved by Mr Äpinus, in a treatise intitled, "Tentamen Theoriæ Electricitatis & Magnetismi." He extends the property of impermeability to air, and all electrica, as well as glass. He supposes impermeability to consist in the great difficulty with which electric substances admit the fluid into their pores, and the slowness with which it moves in them. In consequence of this impermeability of air to the electric fluid, he denies the existence of electric atmospheres, and thinks that Dr Franklin's theory will do much better without them. He also imagines, that all the particles of matter are repulsive of one another: for that otherwise (since all substances have in them a certain quantity of the electric fluid, the particles of which repel one another and are attracted by all other matter), it could not happen, that bodies in their natural state with respect to electricity, should neither attract nor repel one another. He also introduces a number of mathematical calculations; the result of which (says Dr Priestley, with a great deal of probability) cannot be depended upon.

The above is a full explanation of the theory of electricity at present most generally received. It depends on the following principles. 1. All terrestrial substances, as well as the atmosphere which surrounds the earth, are full of electric matter. 2. Glass, and other electric substances, though they contain a great deal of electric matter, are nevertheless impermeable by it. 3. This electric matter violently repels itself, and attracts all other matter. 4. By the excitation of an electric, the equilibrium of the fluid contained in it is broken; and one part of it is overloaded with electricity, while the other contains too little. 5. Conducting substances are permeable to the electric matter through their whole substance, and do not conduct it merely over their surface. 6. Positive electricity is when a body has too much of the electric fluid, and negative electricity when it has too little. Of these positions we shall now adduce those proofs drawn from

71
Attraction and repulsion of glass accounted for.

72
Principles on which Dr Franklin's theory depends.

Theory.

different facts, which seem in the strongest manner to confirm them.

I. "All terrestrial substances, as well as the atmosphere which surrounds the earth, are filled with electric fluid."—Of this the proofs are very easy. There is no place of the earth or sea, where the electric fire may not be collected by making a communication between it and the rubber of an electric machine. Therefore, considering that the whole earth is moist, that moisture is a conductor of electricity, and that every part of the earth must thus communicate with another, it is certain that the electric matter must diffuse itself as far as the moisture of the earth reaches; and this we may reasonably suppose to be to the very centre.

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Proofs of
atmospher-
ical electri-
city.

With regard to the atmosphere, the case is equally clear. We have formerly mentioned in general, that Dr Franklin, and others, had collected electricity from the atmosphere in great quantity during the time of thunder-storms; but it is now found that it may be collected from the air at any time. The best instrument for this purpose is the electrical kite. Mr Cavallo, who hath made a great many experiments in atmospheric electricity, observes that the whole power of this machine lies in the string. A common school-boy's kite answers the purpose as well as any other. The best method of making the string is by twisting two threads of common twine with one of that copper-thread which is used for trimmings. When a kite constructed in this manner was raised, he says, he always observed the string to give signs of electricity, except once. The weather was warm, and the wind so weak, that the kite was raised with difficulty, and could hardly be kept up for a few minutes. Afterwards, however, when the wind increased, he obtained, as usual, a pretty strong positive electricity. Concerning the management of this kite he gives the following directions.

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Mr Caval-
lo's direc-
tions con-
cerning the
electrical
kite.

"In raising the kite, when the weather is very cloudy and rainy, in which time there is danger of meeting with a great quantity of electricity, I generally use to hang upon the string *AB* (Plate CLXXXVII. fig. 78.) the hook of a chain *C*, the other extremity of which falls on the ground. Sometimes I use another caution besides, which is to stand upon an insulating stool; in which situation, I think, that if any quantity of electricity, suddenly discharged by the clouds, strikes the kite, it cannot much affect any person. As to insulated reels, and other such like instruments that some gentlemen have used to raise the kite without any danger of receiving a shock; fit for the purpose as they may appear in theory, they are yet very inconvenient to be managed. Except the kite be raised in the time of a thunder-storm, there is no great danger for the operator to receive any shock. Although I have raised my electrical kite hundreds of times without any caution whatever, I have very seldom received a few exceedingly slight shocks in my arms. In time of a thunder-storm, if the kite has not been raised before, I would not advise a person to raise it while the stormy clouds are just overhead; the danger at such a time being very great, even with the precautions above-mentioned: at that time the electricity of the clouds may be observed, without raising the kite, by a cork-ball electrometer held in the hand in an open place, or,

if it rains, by the electrometer for rain, to be described hereafter.

"By making use of this instrument, I am obliged to keep the kite up no longer than it is necessary to charge the phial, in order to observe the quality of the electricity in the atmosphere; for after the kite has been drawn in, and brought home, I can then examine the electricity of the inside of the phial, which is the same as that of the kite. When the electricity of the kite is very strong, I fix a chain communicating with the ground, at about six inches distance from the string, which may carry off its electricity in case this should increase so much as to put the bystanders in danger."

With all his caution, however, it seems Mr Cavallo could not always avoid danger, even when there was no thunder; as appears from the following account, brought "October 18. 1775. After having rained a great deal down from in the morning and night before, the weather became a little clear in the afternoon, the clouds appearing separated, and pretty well defined. The wind was well, and rather strong, and the atmosphere in a temperate degree of heat. In these circumstances, at three P. M. I raised my electrical kite with 360 feet of string. After the end of the string had been insulated, and a leather ball covered with tin-foil had been hung to it, I tried the power and quality of the electricity, which appeared to be positive and pretty strong. In a short time, a small cloud passing over, the electricity increased a little; but the cloud being gone, it decreased again to its former degree. The string of the kite was now fastened by the silk lace to a post in the yard of the house, and I was repeatedly charging two coated phials and giving shocks with them. While I was so doing, the electricity, which was still positive, began to decrease, and in two or three minutes it became so weak that it could hardly be perceived with a very sensible cork-ball electrometer. Observing at the same time, that a large and black cloud was approaching the zenith (which, no doubt, caused the decrease of electricity), indicating imminent rain, I introduced the end of the string through a window in a first-floor room, wherein I fastened it by the silk lace to an old chair. The quadrant electrometer was set upon the same window, and was by means of a wire connected with the string of the kite. Being now three quarters after three o'clock, the electricity was absolutely imperceptible: however, in about three minutes time it became again perceptible; but, upon trial, was now found to be negative. It is therefore plain, that its stopping was nothing more than a change from positive to negative; which was evidently occasioned by the approach of the cloud, part of which by this time had reached the zenith of the kite, and the rain also had begun to fall in large drops. The cloud also came farther on; the rain increased; and the electricity keeping pace with it, the electrometer soon arrived at 15°. Seeing now that the electricity was pretty strong, I began again to charge the two coated phials, and to give shocks with them; but the phials had not been charged above three or four times, before I perceived that the index of the electrometer was arrived at 35°, and was keeping still increasing. The shocks being now very smart, I desisted from charging the phials any longer; and, considering the rapid advance of the electricity, thought to take

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Great quan-
tity of elec-
tricity
brought
down from
a cloud.

Theory.

Theory.

take off the insulation of the string, in case that, if it should increase farther, it might silently be conducted to the earth without causing any bad accident by being accumulated in the insulated string. To effect this, as I had no proper apparatus near me, I thought to remove the silk lace, and fasten the string itself to the chair. Accordingly I disengaged the wire that connected the electrometer with the string; laid hold of the string; untied it from the silk lace, and fastened it to the chair: but while I effected this, which took up less than half a minute of time, I received about 12 or 15 very strong shocks, which I felt all along my arms, in my breast, and legs; shaking me in such a manner, that I had hardly power enough to effect my purpose, and to warn the people in the room to keep their distance. As soon as I took my hands off the string, the electricity (in consequence of the chair being a bad conductor) began to snap between the string and the shutter of the window, which was the nearest body to it. The snapping, which were audible at a good distance out of the room, were at first isochronous with the shocks which I had received; but, in about a minute's time, oftener; so that the people of the house compared their sound to the rattling noise of a jack going when the fly is off. The cloud now was just over the kite; it was black, and well defined, almost of a circular form, its diameter appearing to be about 40°. The rain was copious, but not remarkably heavy. As the cloud was going off, the electrical snapping began to weaken, and in a short time became inaudible. I went then near the string, and finding the electricity weak, but still negative, I insulated it again, thinking to keep up the kite some time longer; but observing that another larger and denser cloud was approaching towards the zenith, and I had then no proper apparatus at hand to prevent every possible bad accident, resolved to pull the kite in: accordingly a gentleman who was by me began pulling it in, while I was winding up the string. The cloud was now very nearly over the kite; and the gentleman told me that he had received one or two slight shocks in his arms; and that, if he was to receive another, he would certainly let the string go: upon which I laid hold of the string, and pulled the kite in as fast as I could without any farther observation; being then ten minutes after four o'clock.—N. B. There was neither thunder nor lightning perceived that day, nor indeed for some days before or after."

From his observations on the electricity of the atmosphere, Mr Cavallo deduces the following conclusions.

"1. That there is in the atmosphere at all times a quantity of electricity; for whenever I use the above-mentioned instrument, it always acquires some electricity.

"2. That the electricity of the atmosphere, or fogs, is always of the same kind, namely, positive; for the electrometer is always negative, except when it is evidently influenced by heavy clouds near the zenith.

"3. That, in general, the strongest electricity is observable in thick fogs, and also in frosty weather; and the weakest, when it is cloudy, warm, and very near raining; but it does not seem to be less by night than in the day.

"4. That in a more elevated place the electricity is stronger than in a lower one; for having tried the atmospheric electrometer both in the stone and iron gallery on the cupola of St Paul's cathedral, I found that the balls diverged much more in the latter than in the former less elevated place. Hence it appears, that if this rule takes place at any distance from the earth, the electricity in the upper regions of the atmosphere must be exceedingly strong."

The conclusions drawn from the experiments with the kites, are as follow.

"1. The air appears to be electrified at all times; its electricity is constantly positive, and much stronger in frosty than in warm weather; but it is by no means less in the night than in the day time.

"2. The presence of the clouds generally lessens the electricity of the kite; sometimes it has no effect upon it; and it is very seldom that it increases it a little." To this the above mentioned influence is a most remarkable exception.

"3. When it rains, the electricity of the kite is generally negative, and very seldom positive.

"4. The aurora borealis seems not to affect the electricity of the kite.

"5. The electric spark taken from the string of the kite, or from any insulated conductor connected with it, especially when it does not rain, is very seldom longer than a quarter of an inch; but it is exceedingly pungent. When the index of the electrometer is not higher than 20°, the person that takes the spark will feel the effect of it in his legs; it appearing more like the discharge of an electric jar than the spark taken from the prime conductor of an electrical machine.

"6. The electricity of the kite is generally stronger or weaker, according as the string is longer or shorter; but it does not keep any exact proportion to it. The electricity, for instance, brought down by a string of 100 yards, may raise the index of the electrometer to 20, when, with double that length of string, the index of the electrometer will not go higher than 25.

"7. When the weather is damp, and the electricity is pretty strong, the index of the electrometer, after taking a spark from the string, or presenting the knob of a coated phial to it, rises surprisingly quick to its usual place; but in dry and warm weather it rises exceedingly slow."

II. The second position requisite for establishing Dr Franklin's theory is, "That glass and other electric substances, though they contain a great deal of electric matter, are nevertheless impermeable by it." This assertion evidently has a contradictory appearance. It is very difficult, if not impossible, to conceive, that any substance can be full of a fluid, and yet impermeable by that fluid; especially when we continually talk of putting in an additional quantity into one side, and taking out of the other. Nay, what is still more extraordinary, the thinner the glass is, *i. e.* the less quantity of electric matter it can contain, the more we are able to put into it; for the thinner a glass is, the more easily does it receive a high charge.

The chief arguments for the impermeability of glass by the electric fluid are drawn from the phenomena of the Leyden phial. It is indeed very plain, that there is in that case an expulsion of fire from the outside of the phial, and that the interior is insulated. Arguments for the impermeability of glass are related.

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Conclusions
drawn from
the experi-
ments.

77

Theory.

the same time that it is thrown upon the inside. This appears from numberless experiments, but is most readily observable in the following. Let a coated phial be set upon an insulating stand, and the knob of another phial brought near the coating of the first. As soon then as the electric sparks are discharged from the prime conductor to the knob of the first bottle, an equal number will be observed to proceed from the coating of the first to the knob of the second. This is very remarkable, and an unphilosophical observer will scarce ever fail to conclude, that the fire runs directly through the substance of the glass. Dr Franklin, however, concludes that it does not, because there is found a very great accumulation of electricity on the inside of the glass, which discovers itself by a violent flash and explosion when a communication is made between the outside and inside coatings. But it must be observed, that there is here no other reason for concluding the glass to be impermeable, except that we suppose the electric matter to be accumulated on one side of the glass, and deficient on the other. If this supposition therefore cannot be proved, the evidence of sense, which indeed is very strong in favour of the permeability, must undoubtedly preponderate. It is said, indeed, that if the glass was permeable by the electric matter, a phial would be discharged immediately after being charged, or rather could never be charged at all; because the matter would no sooner be thrown upon one side than it would fly off from the other. This supposition, however, depends entirely upon the above-mentioned one, namely, that in bodies positively electrified there is an accumulation, and in such as are negatively electrified there is a deficiency of fluid; which never can be proved.

Another argument against the permeability of glass and other electrics is, that coated phials, it is said, standing upon electric substances, cannot be charged. This, however, seems to be very much exaggerated. A phial, though ever so perfectly insulated, will always receive a charge from a machine that acts very powerfully. Nay, it is certain, that though a phial is placed in such a manner, that both its knob and outside coating are in contact with the prime conductor, it will still receive a charge; much less indeed in this case than in any other, but still the shock will be perceptible.

In 1759, Mr Wilson read a paper before the Royal Society, in which the permeability of glass by the electric fluid was asserted. The experiments from which he deduced this conclusion were the following. He took a very large pane of glass, a little warmed; and holding it upright by one edge, while the opposite edge rested upon wax, he rubbed the middle part of the surface with his finger, and found both sides electrified *plus*. He accounted for this from the electrical fluid passing through the glass from his finger to the opposite side. But here Dr Priestley observes, that on Franklin's principles it ought to be so. If one side be rubbed by the finger, it acquires from it some electrical fluid. This being spread on the glass as far as the rubbing extended, repels an equal quantity of that contained in the other side of the glass, and drives it out on that side, where it stands as an atmosphere, so that both sides are found positively electrified. Mr Wilson also tried another experiment, which seemed more

decide than the former: Having by him a pane of glass, one side of which was rough and the other smooth, he rubbed it slightly on one side; upon doing which, both sides were electrified *minus*. This also Dr Priestley attempts to reconcile with Franklin's hypothesis. "As the electric fluid, contained in the glass (says he), is kept equal in both sides by the common repulsion; if the quantity in one side is diminished, the fluid in the other side, being less repelled, retires *inward*, and leaves that surface also *minus*." But here it is impossible to avoid observing, that Dr Priestley's own words, in the strongest manner, militate against the doctrine he means to establish. The quantity of fluid in one side being diminished, that on the other, he says, *retires inward*. But into what does it retire? if into the substance of the glass, then the glass is undoubtedly permeable by it; and this is the very thing which Dr Priestley argues against.

III. "The electric matter violently repels itself, and the electric fluid attracts all other matter." The proofs of this position are chiefly derived from the following experiment, and others of a similar kind. Let a smooth piece of metal be insulated, and bring an excited glass tube near one end of it. A spark of positive electricity will be obtained from the other end; after which, if the tube is suddenly removed, the metal becomes electrified negatively. Here, then, it is said, is a plain repulsion of one part of the electric fluid by another. That contained in the tube repels the fluid contained in the nearest end of the metal; of consequence it is accumulated in the other end, and when the tube is removed, the metal is found to be deprived of part of its natural quantity of electricity, or is electrified negatively.—On such experiments as this, however, it is obvious to remark, that we ought first to prove that positive electricity consists in an accumulation, and negative electricity in a deficiency, of the electric fluid. But while this is only *supposed*, it is impossible that any proofs drawn from the supposition can be conclusive.

IV. "By the excitation of an electric, the equilibrium of the fluid contained in it is broken, and one part is overloaded with electricity, while the other contains too little." This position is entirely hypothetical. No electrician hath yet explained, in a satisfactory manner, how the fluid is procured by the excitation of glass or any other electric substance. Dr Priestley, instead of giving an explanation, proposes several queries concerning it. Mr Cavallo tells us, that the act of excitation pumps as it were the electric fluid from the rubber, and consequently from the earth. He adds, "By what mechanism one body extracts the electric fluid from another, is not yet known. The celebrated Father Beccaria supposes, that the action of rubbing increaseth the capacity of the electric, *i. e.* renders that part of the electric which is actually under the rubber, capable of containing a greater quantity of electric fluid: hence it receives from the rubber an additional share of fluid, which is manifested upon the surface of the electric, when that surface is come out from the rubber; in which state it loses, or, as it were, contracts its capacity. Signior Beccaria's experiment to prove this supposition is the following. He caused a glass plate to be rubbed by a rubber applied on one side of the plate, while it was turning vertically; and holding at the same time a linen thread on the other side of the plate

Theory.

78
The electric fluid cannot be proved repulsive of one itself.

79
Beccaria's hypothesis concerning excitation.

Theory.

Theory.

plate just opposite to the rubber, he observed that the thread was not attracted by that part of the glass which corresponded to the rubber, but by that which was opposite to the surface of the glass that had just come out from the rubber; which shows, that the fluid acquired by the glass plate did not manifest its power until the surface of the glass was come out from the rubber." But from this experiment it seems impossible to draw any conclusion concerning the capacity of glass either one way or other. It is evident, therefore, that whatever parts of Dr Franklin's hypothesis rest on this supposition concerning excitation, are entirely void of evidence.

83
Whether the electric fluid pervades the substance of conductors.

V. "Conducting bodies are permeable by the electric fluid through the whole of their substance, and do not conduct it merely over their surface." The proof of most commonly adduced in favour of this position, is the following experiment. Take a wire of any kind of metal, and cover part of it with some electric substance, as rosin, sealing-wax, &c. then discharge a jar through it, and it will be found that it conducts as well with as without the electric coating. This, says Mr Cavallo, proves that the electric matter passes through the substance of the metal, and not over its surface. A wire, adds he, continued through a vacuum, is also a convincing proof of the truth of this assertion. Even here, however, the proof, if impartially considered, will be found very defective. It is a fact agreed upon by all philosophers, that bodies which to us are apparently in contact, do nevertheless require a very considerable degree of force to make them actually touch one another. Dr Priestley found that a weight of six pounds was necessary to press 20 shillings into close contact, when lying upon one another on a table. A much greater weight was necessary to bring the links of a chain into contact with each other. It cannot be at all incredible, therefore, that a wire, though covered with sealing-wax or rosin, should still remain at some little distance from the substance which covers it. The following experiments of Dr Priestley also seem to be much in favour of the supposition that the electric fluid passes chiefly over the surface of conducting substances.

"From the very first use of my battery (says he), I had observed a very black smoke or dust to arise on every discharge, even when no wire was melted; and the brass chain I made use of was of a considerable thickness. I observed, that a piece of white paper, on which lay the chain I was using to make the discharge, was marked with a black stain, as if it had been burnt, wherever it had touched it. I neglected the experiment, till, some time after, observing a very striking appearance of the same kind, I was determined to attend to the circumstances of it a little more particularly. I made my chain very clean, and wrapping it in white paper, I made a discharge of about 40 square feet through it, and found the stain wherever it had touched the paper. Some time after I wrapped the paper, in the same manner, round a piece of brass wire; but, making a discharge through it, saw no stain. To ascertain whether this appearance depended upon the discontinuity of the metallic circuit, I stretched the chain with a considerable weight, and found the paper on which it lay, as the shock passed

through it, hardly marked at all. Finding that it depended upon the discontinuity, I laid the chain upon white paper, making each extremity fast with pins stuck through the links; and when I had made the discharge, observed that the black stains were directly opposite to the body of the wire that formed the chain, and not to the intervals, as I had sometimes suspected. A chain five feet four inches long, which weighed one ounce seventeen penny-weights four grains, lost exactly half a grain after each discharge.

"In making the mark above-mentioned, I once happened to lay the chain so as to make it return at a sharp angle, in order to impress the form of a letter upon the paper; and observed, that on the discharge, the part of the chain that had been doubled was displaced, and pulled about two inches towards the rest of the chain. At this I was surprised, as I thought it lay so, that it could not slide by its own weight. Upon this I repeated the experiment with more accuracy. I stretched the whole chain along a table, laying it double all the way, and making it return by a very sharp angle. The consequence always was, that the chain was shortened about two inches, and sometimes more, as if a sudden pull had been given to it by both the ends. Suspecting that the black smoke which rose at every discharge, might come, not from the chain, but from the paper, or the table on which it lay, and which was probably burnt by the contact of it, I let the chain hang freely in the air; but, upon making the discharge, I observed the same gross black smoke that had before risen from the paper or the table. Fig. 76. represents the spots made upon the paper by a chain laid over it. The breadth of the spots is about the mean thickness of the wire of the chain, and *a* *b* marks the place to which that part of the chain which returned was thrown back by the discharge.

"Being willing to try what would be the effect of laying the chain in contact with non-conductors, I dipped it in melted rosin till it had got a coating of considerable thickness. When it was quite stiff, I laid it carefully, without bending, upon white paper, and made the discharge through it. The rosin was instantly dispersed from all the outside of the chain, it being left as clean as if none had ever been put on. That with which the holes in the chain had been filled having been impelled in almost all directions, was beaten to powder; which, however, hung together but was perfectly opaque; whereas it had been quite transparent before this stroke. I next laid the chain upon a piece of glass, which was marked in the most beautiful manner wherever the chain had touched it; every spot the width and colour of the link. The metal might be scraped off the glass at the outside of the marks; but in the middle part it was forced within the pores of the glass. On the outside of this metallic tinge was the black dust, which was easily wiped off.

From these experiments it would seem, that the electrical flash had passed over the surface of the chain rather than through its substance; seeing it threw off the rosin with such extreme violence. The same thing appears from the manner in which electricity generally acts, which is not according to the solid contents of any substance, but according to the dimensions of its

84
A chain shortened by the electric shock.

Plate
CLXXVII.

Theory.

surface. It is not to be doubted, however, but that, where a great quantity of electric matter is made to pass along a very small wire, it will enter the substance of the metal. This appears from the possibility of melting wires by the force of electric batteries, and even totally dissipating them into small globules. To accomplish this, it is only necessary to connect the hook communicating with the outside coating of a battery, containing at least 30 square feet of coated surface, with a wire that is about one-fiftieth part of an inch thick and about two feet long. The other end of it must be fastened to one end of the discharging rod: this done, charge the battery; and then by bringing the discharging rod near its wires, send the explosion through the small wire, which by this means will be made red hot and melted, so as to fall upon the floor in different glowing pieces. When a wire is melted in this manner, sparks are frequently seen at a considerable distance from it, which are red hot particles of the metal, that, by the violence of the explosion, are scattered in all directions. If the force of the battery is very great, the wire will be entirely dispersed by the explosion, so that none of it can be afterwards found. If it is required to melt such particles as cannot easily be drawn into wires, ores, for instance, or grain-gold, they may be set in a train upon a piece of wax: they are then to be put into the circuit, and an explosion sent through them, which, if sufficiently strong, will melt them as well as the wires. If a wire is stretched by weights, and a shock is sent through it which renders it just red hot, the wire, after the explosion, is found to be considerably lengthened.

82.
Dr Franklin's hypothesis concerning positive and negative electricity cannot be proved.

VI. The last position on which Dr Franklin's theory depends, and which indeed may be called the foundation of the whole, is, "That positive electricity is an accumulation, or too great a quantity, of electric matter contained in a body; and negative electricity is when there is too little." Of this, however, there is not one solid proof; and all attempts that have hitherto been made to prove it, are only arguing in a circle, or proving the thing by itself. Thus, for instance, a body electrified positively, attracts one that is electrified negatively; because the first has too much, and the other too little, electric matter. But how do we know that one has too much, and the other too little, electricity? Because they attract each other. Again it has been proved, that when a phial is electrified positively, there is as constant a stream of fire from the outside coating, as there is from the conductor to the inside coating. Therefore, it is said, the outside of the glass has too little, and the inside too much, electricity. But how is this known to be the case? Because glass is impermeable by the electric fluid. And how is glass known to be impermeable? Because, in the above experiment, one side has too much, and the other too little, electricity. Thus in every instance, the arguments for Dr Franklin's hypothesis return into themselves, and no conclusion can be drawn from them. In the subsequent section, the nature of the electric fluid is particularly considered, where the improbability of its ever being accumulated in the substance of solid bodies will more plainly appear.

Theory.

SECT. VI. *An Inquiry into the Nature of the Electric Fluid; with an Attempt to explain the principal Phenomena of Electricity, from the known Laws by which other Fluids are observed to act upon one another.*

IN making this inquiry, or indeed any other, it is proper to take for granted as little as possible. No position should be assumed as the basis of any reasoning whatever, except what has been proved by incontrovertible facts. In the present case, therefore, it is sufficient to assume as a fact what hath been already proved by innumerable experiments, namely, That the air, the earth, and sea, all contain great quantities of electric fluid. The question which most naturally suggests itself when this is once admitted, is, Whence hath the electric fluid come? is it essentially inherent in these bodies, or hath it come from without? This cannot be resolved, without considering the nature of the fluid itself, and whether it is analogous to any other which is more generally known.

§ 1. *Proofs of the Identity of the Electric Fluid and Elementary Fire or Light of the Sun.*

THE similarity between the electric matter and fire, naturally suggested to the first observers, that it was no other than elementary fire, which pervaded all substances, as we have already mentioned. This, however, was objected to; and the principal objection was, that though the electric matter emitted light, and had the appearance of fire, it nevertheless wanted its most essential quality, namely, *burning*. In particular, the blast which comes from an electrified point, feels cold instead of being hot; and where great quantities of the fluid are forced with violence through certain substances, and thus set them on fire, it was thought that the fire might be occasioned by the internal commotion excited among their small particles. This objection, however, seems now to be totally removed. The dispute concerning the preferable utility of pointed or knobbed conductors for securing buildings from lightning, occasioned the fitting up of a more magnificent apparatus than had ever appeared before. An immense conductor was constructed at the expence of the board of ordnance, and suspended in the *Pantheon*. It consisted of a great number of drums covered with tinfoil, which formed a cylinder of above 155 feet in length, and more than 16 inches in diameter; and to this vast conductor were occasionally added 4800 yards of wire. The electric blast from this machine fired Gun-powder in the most unfavourable circumstances that can be imagined, namely, when it was drawn off by a sharp point, in which case it has generally less force than in any other. The method of doing this was as follows. Upon a staff of baked wood a stem of brass was fixed, which terminated in an iron point at the top. This point was put into the end of a small tube of Indian paper, made somewhat in form of a cartridge, about an inch and a quarter long, and two-tenths of an inch in diameter. When the cartridge was filled with common gun-powder, unbruised, a wire communicating with the earth was then fastened to the bottom of the brass stem. The charge in the great cylinder being continually kept up by the motion of the wheel, the top of the cartridge was brought

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Gun-powder fired by the electric blast.

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Theory.

Theory.

very near the drums, so that it frequently even touched the tin-foil with which they were covered. In this situation a small faint luminous stream was frequently observed between the top of the cartridge and the metal. Sometimes this stream would set fire to the gun-powder the moment it was applied; at others, it would require half a minute or more before it took effect. But this difference in time was supposed to be owing to some small degree of moisture in the powder or the paper, which was always unfavourable to the experiment. Tinder was fired much more readily.

As it therefore appears, that the electric fluid, when it moves through bodies either with great rapidity, or in very great quantity, will set them on fire, it seems scarce disputable, that this fluid is the same with the element of fire. For further proofs of this opinion, which is now adopted by some very eminent philosophers, see the articles FIRE and HEAT. See also CHEMISTRY-Index. This being once admitted, the source from whence the electric fluid is derived into the earth and atmosphere, must be exceedingly evident, being no other than the sun, or source of light itself. The vast quantity of light which continually comes from him to the earth must of necessity be absorbed by that opaque body, at least in great part. It is impossible it can remain there, because there is a perpetual succession of new quantities coming from the sun. It must be observed, however, that as this fluid receives a great number of different directions after once it enters the earth, it cannot appear in its natural form of fire or light, till it receives a new motion similar to what it had when proceeding from the sun. The solar light only burns, or produces heat, when diverging from a centre, or converging towards one. The heat is always greatest at the central point; and even there, no heat is produced except where the light passes through a resisting medium. In those cases likewise the electric fluid burns. When discharged with violence from an electrified bottle, it flies out on all sides, and then will fire gun-powder, or other combustible substances. The same thing it will do when converging towards a point, if in sufficient quantity, as was observed in the experiment with the large conductor above mentioned. But when the electric fluid neither meets with any considerable resistance, diverges from a centre, nor converges towards one, it is almost always invisible, and without heat. A most remarkable proof of this we have, even when a vast quantity of electric matter is forced to go through a very small wire. Dr Priestley tells us he had once an opportunity of observing what part of the conductors which form an electric circuit are most affected by the explosion. Upon discharging a battery of 51 square feet thro' an iron wire nine inches long, the whole of it was glowing hot, and continued so for some seconds. The middle part grew cool first, while both the extremities were sensibly red. When the wire was afterwards examined, both the extremities were found quite melted; an inch or two of the part next to them was extremely brittle, and crumbled into small pieces on being handled; while the middle part remained pretty firm, but had quite lost its polish, so that it looked darker than before. This is precisely what would have happened, had both ends been put into a common fire.

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Action of
the electric
matter and
light com-
pared.

We are very sure, that the same quantity of electric matter passed through the middle of the wire, that entered one end of it and went out at the other. Why then did it not produce the same degree of heat in the middle that it did at each end? The reason is plain: At one end it was in a state of *convergence* from the battery to the point of the wire; at the other, it was in a state of *divergence* from the point of the wire to the battery. At the points, therefore, an intense heat was produced; but in the middle, where the fluid neither converged nor diverged, but moved forwards in a parallel direction, the heat was much less. Now we know that this is the case with the solar light itself. At the focus of a burning-glass there is an intense heat both where the convergence ends and the divergence begins. But where this divergence considerably ceases, and the motion of the light becomes more parallel, the heat is vastly diminished. The case is the same with a common fire, and with all burning bodies; for heat never acts but from a centre, and is always greatest at the central point. It is true, that we can never produce electric fire without at the same time producing a violent shock exceedingly different from the *burning* of common fire. But the reason of this is, that we cannot produce a divergence in a stream of electric matter, without at the same time giving it such a motion in some other direction, that its impetus becomes very perceptible. If it was in our power to make the flash produced by an electric bottle keep its place, we cannot suppose that any shock, or other sensation than heat, would be felt. But there is no possibility of hindering it from flying with prodigious celerity from one side of the bottle to the other. Therefore, as it is neither in a state of divergence nor convergence, except where it comes out from and enters into the bottle, no sensation is perceived except what arises from its change of place; and hence it is said, that the electric matter hath no heat.

§ 2. *The Identity of Electric Matter and Light farther considered; with some positive Proofs, that Electric Substances are actually penetrated by the Electric Fluid.*

The only objection of any strength which can arise to the identity of the electric fluid and light is, the surprising ease with which the latter penetrates glass, and the seeming stop which is put to the motions of the former when a piece of glass or any other electric substance is presented to it. Here, however, it must be observed, that light, as proceeding from a luminous body, must be regulated by very different laws from light which is absorbed by opaque bodies, and consequently subjected to motions quite different from what it originally had. Water, the only fluid with which we are very well acquainted (tho' all others we know seem to be regulated by the same laws), is capable of two very different motions. The one is a rectilinear one, by which great quantities of it run from one place to another. The other is not so easily explained. It may, however, be very readily observed, by throwing a small stone into a pool of water. A great number of concentric circles will be propagated from the place where the stone fell, as from a centre, which will gradually grow larger and larger. If another stone is thrown in at some distance, similar circles will proceed from the place where it fell. These will meet with the former,

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Objection
concerning
the impenetrability
of glass answered.

Theory.

and cros them without interfering with each other in the leaf. It is certain, however, that two streams of water rushing opposite to one another, would shatter and destroy each other. If, therefore, there is a difference in the motion of the electric fluid when it burns, and when it does not (which there certainly is), we may easily suppose it possible, that glafs should obstruct one kind of motion and not another: In which case, the glafs would seem to be permeable by the fluid when manifesting itself by the first kind of motion, and not so when it manifests itself by the other.

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Surprising
experi-
ments con-
cerning the
transparen-
cy of bo-
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It hath commonly been thought, that the transparency of bodies depends upon the rectilinear direction of their pores, and opacity upon the situation of them in some other direction. Electrical experiments, however, have shown that this is not the case. Sealing-wax and pitch are as opaque bodies as we are acquainted with; yet in Mr Hauksbee's experiments, mentioned n° 4. these substances were both rendered transparent by the action of the electric fluid. These experiments are confirmed by some others still more surprising, mentioned by Dr Priestley. See also below Sect. VIII. One was made by S. Beccaria. He discharged an electric shock through some brass dials sprinkled between two plates of sealing-wax. The whole was perfectly luminous and transparent. The most extraordinary experiment, however, was made by Dr Priestley himself, of which he gives the following account. "I laid a chain in contact with the outside of a jar lightly on my finger, and sometimes kept it at a small distance by means of a thin piece of glafs; and, if I made the discharge at the distance of about three inches, the electric fire was visible on the surface of the finger, giving it a sudden concussion, which seemed to make it vibrate to the very bone; and when it happened to pass on that side of the finger which was opposite to the eye, the whole seemed perfectly transparent in the dark."

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Consequen-
ces from
them.

Experiments of this kind, though they have not hitherto been much pursued by electricians, seem to be more worthy of notice than almost all others. One consequence which may be derived from them is, that there is in bodies, whether electric or non-electric, a certain subtle medium, on the motion of which transparency depends. That is, when the medium is at rest, the body is opaque; but when set in motion, it becomes transparent. This motion, we see, may be given in two different ways. One is by simple electrification *in vacuo*, according to Mr Hauksbee's experiments. The other is, by sending the flash of an electrified bottle over their surface. In Dr Priestley's experiment, he could determine the motion to be of the vibratory kind; and hence we may easily conclude, that some bodies may be constructed in such a manner, that they are capable of transmitting the vibrations of this fluid, but not any other kind of motion. Such kinds of bodies will be naturally transparent: but others, whose particles are disposed in such a manner that the vibrations cannot be propagated thro' them without considerable violence, are naturally opaque. The question then only is, What is this subtle medium, the vibrations of which occasion transparency? It is scarce possible to answer this question in another manner than by saying, that it is the electric fluid. That it is this fluid which gives the power to electric sub-

Theory.

stances, has never been denied. That the motion of this fluid along the surfaces of bodies throws another fluid within them into vibrations, is also evident from the experiments above mentioned. All bodies are confessed to have much of this fluid in their pores: therefore, if a quantity of the same matter passes over the surface of any body, it must affect what is within its substance with a motion of some kind or other; because it affects that which lies on the outside, and this cannot fail to affect all the rest. This motion Dr Priestley's experiment determines to be of the vibratory or tremulous kind; and, indeed, it is natural to think it should be so. The vibrations of the electrical fluid, therefore, conduct light through opaque bodies. But whatever fluid is conducted by the vibration of another, must itself also vibrate while it is so conducted. Light, therefore, vibrates when emitted from luminous bodies. In the present case, these vibrations are originally occasioned by the electric flash. They are conducted thro' opaque bodies by the vibrations of the electric fluid. The air is also full of the same fluid. The air is naturally transparent; but we have seen that transparency consists only in the easy transmission of a vibratory motion of the electric fluid. The light, therefore, is perpetually conducted by means of the vibrations of this fluid: therefore, the vibrations of the electric fluid and light are the same; for no two fluids are always capable of setting one another in motion precisely in the same manner, unless their nature is in all respects exactly the same.

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Light pro-
ved to be a
vibration of
the electric
fluid.

These experiments seem in the strongest manner to prove the identity of the electric fluid and light, and that both are transmitted through electric as well as other substances. The reason, therefore, of the seeming stop, which is observed in our electrical operations by the intervention of glafs, is, that in all artificial electricity, the fluid has a very considerable progressive motion, which cannot be easily propagated through the solid substance of any body, especially where there is a pretty strong resistance on the other side; which shall afterwards be shown to be the case with this fluid when passing through electric substances.

§ 3. Of the Passage of the Electric Fluid over the Surface, and through the Substance, of different Bodies.

DR PRIESTLEY hath made many very curious experiments concerning the discharging of electric shocks over the surface of different bodies; and finds, that this means a battery may be made to discharge itself at a much greater distance than it would do if sent directly through the air. The experiments were begun with ice; and he first accidentally discovered, that, when the shock of a common jar was discharged on a plate of ice, it would sometimes run over the surface and strike the chain directly on the other side. With a single jar, however, the distance was not much greater than what it would have passed over in the usual way; but, with a battery, it exceeded the usual distance in a very great degree. Endeavouring to make a circular spot, such as he had formerly made on metals, upon a piece of raw flesh, he took a leg of mutton, and laying the chain that communicated with the outside of the battery over the flank, he took the explosion on the outward membrane, about seven inches from the chain; but was greatly surprised to observe the electric fire not

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Priest-
ley's ex-
periments
with ice;

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With raw
flesh;

Theory.

Theory.

to enter the flesh, but to pass in a body along the surface of it to come to the chain. Thinking that this might be occasioned by the fatty membrane on which the explosion was made, he again laid the chain in the same manner over the flank, and took the explosion upon the muscular fibres, where they had been cut off from the rest of the body; but still the fire avoided entering the flesh, made a circuit of near an inch round the edge of the joint, and passed along the surface to come to the chain as before, though the distance was near 11 inches. Imagining that this effect was promoted by the chain lying lightly on the surface of the flesh, and therefore not actually in contact with it, he took another explosion upon the hook of the chain, which was thrust into the flesh. On this the fire entered the mutton; and as he held it in his hands, both his arms were violently shocked up to his shoulders.

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With water;

The Doctor next determined to try the effect of different conducting substances in the same manner; and of these water was the most obvious. "Next day, (says he) I laid a brass rod communicating with the outside of the battery, very near the surface of a quantity of water (to resemble the chain lying upon the surface of the flesh, without being in contact with it), and, by means of another rod furnished with knobs, made a discharge on the surface of the water, at the distance of several inches from any part of the rod; when the electric fire struck down to the water, and, without entering it, passed visibly over its surface till it arrived at that part of the rod which was nearest the water, and the explosion was exceedingly loud. If the distance at which I made the discharge exceeded seven or eight inches, the electric fire entered the water, making a beautiful star upon its surface, and yielding a very dull sound. When I first made this experiment of the electric flash passing over the surface of water, I thought it necessary, that neither the piece of metal communicating with the outside, nor that communicating with the inside, of the jars, should touch the water immediately before the discharge. But I afterwards found, that the experiment would answer, tho' either, or even both of them, were dipped in the water: for, in this case, the explosion would still prefer the surface to the water itself, if the distance was not very great; and would even pass at a greater distance along the surface, when there was a nearer passage from one rod to the other in the water."

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With many other bodies.

He afterwards tried to pass the electric flash over the surfaces of a great number of different bodies, but found it impossible with many of them. He therefore imagined that this property of conducting a shock over its surface was peculiar to water and raw flesh. It was found, however, that the flash passed over the surface of a touch-stone, and likewise over a piece of the best kind of iron ore, exceedingly smooth on some of its sides. The piece was about an inch thick, and three inches in its other dimensions. The full charge of a jar of three square feet would not enter it. The explosion passed over the surface of oil of vitriol, with a dull sound and a red colour; but in all other cases, if it passed at all, it was in a bright flame, and with a report peculiarly loud. It passed over the surface of the most highly rectified spirit of wine without firing it; but when too great a distance was taken,

the electric fire entered the spirit, and the whole was in a blaze in a moment.

This was the case when such substances were employed as are but indifferent conductors of electricity; raw flesh, for instance, water, &c. When good conductors were used, such as charcoal of different kinds, no remarkable appearances were produced. So far was the shock from passing visibly over the surface of any metal, that, if the distance through the air, in order to a passage through the metal, was ever so little nearer than the distance between the two surfaces, it never failed to enter the metal; so that its entering the surface of the metal, and its coming out again, seemed to be made without obstruction. If as much water was laid on a smooth piece of brass as could lie upon it, it would not go over the surface of the water, but always struck thro' the water into the metal. But if the metal lay at any considerable depth under the water, it would prefer the surface. It even passed over three or four inches of the surface of water as it was boiling in a brass pot, amidst the steam and bubbles, which seemed to be no hindrance to it. Animal fluids, however, of all kinds, seemed peculiarly to favour this passage of the electric matter over their surface; and the report of these explosions was manifestly louder than when water was used. In all cases of this kind, the report was considerably louder than when the discharge was made in the common way. The explosions were observed by persons out of the house, and in a neighbouring house, very much to resemble the smart cracking, of a whip. "But (says Dr Priestley) the found made by these explosions, though by far the loudest that ever I heard of the kind, fell much short of the report made by a single jar, of no very great size, of Mr Ræcklrow's; who says, that it was as loud as that of a pistol." He also observes, that when the electrical explosion does not pass over the surface of the water, but enters it, a regular star is made upon the surface, consisting of ten or a dozen rays: and what is very remarkable, those rays which stretch towards the brass rod that communicates with the outside of the battery are always longer than the rest; and if the explosion is made at such a distance as to be very near taking the surface, those rays will be four or five times longer than the rest, and a line bounding the whole appearance will be an ellipsis, one of whose foci is perpendicularly under the brass knob with which the discharge is made.

When an electric battery is discharged upon smooth pieces of metal, the effects are very different from any spots produced by those we have yet mentioned. Dr Priestley having constructed some large batteries, determined to try what would be the effects of a very great electric power discharged upon metals and other substances; and, in the course of his random experiments, he made the following discoveries. "June 13. 1766 (says he), after having discharged a battery of about 40 square feet with a smooth brass knob, I accidentally observed upon it a pretty large circular spot, the centre of which seemed to be superficially melted, in a great number of dots; larger near the centre, and smaller at a distance from it. Beyond this spot was a circle of black dust which was easily wiped off: but what I was most struck with was, that after an interruption of melted places, there was an entire and exact circle of shining dots, consisting of places superficially melted like those as

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the centre. The appearance of the whole, exclusive of the black dust, is represented Plate CLXXVII. fig. 75. n^o 1.

"June 14th, I took the spot upon smooth pieces of lead and silver. It was in both cases like that on the brass knob; only the central spot on the silver consisted of dots disposed with the utmost exactness, like radii from the centre of a circle, each of which terminated a little short of the external circle. I took the circular spot upon polished pieces of several metals with the charge of the same battery, and observed that the cavities in some of them were deeper than in others; as I thought in the following order, beginning with the deepest, tin, lead, brass, gold, steel, iron, copper, silver. I will not be positive as to the order of some of the metals; but silver was evidently not affected a fourth part so much as gold, and much less than any of the others. The circles were marked as plain, but the impression was more superficial.

"I also made the explosion between a piece of lead just solid after melting, and another smooth piece that I had kept a considerable time. The piece of fresh lead was melted more than the other, but there was no other difference between them. The femimetals, as bismuth and zinc, received the same impression as the proper metals; being melted nearly as much as iron. I made three discharges between a piece of highly polished steel and a piece of very smooth iron, and in all cases thought the steel was more deeply melted than the iron.

"Presently after I had observed the single circle, I imagined, that, whatever was the cause of the appearance, it was not improbable but that two or more concentric circles might be procured, if a greater quantity of coated glass was used, or perhaps if the explosion was received upon metals that were more easily fused than brass. Accordingly, June 27, taking the moderate charge of a battery, consisting of about 38 square feet, upon a piece of tin, I first observed a second outer circle, at the same distance from the first, as the first was from the central spot. It consisted of very fine points hardly visible, except when held in an advantageous light; but the appearance of the whole was very beautiful, and was such as is represented Plate CLXXVII. fig. 75. n^o 2.

"Having hitherto found the circles the most distinct on metals that melt with the least degree of heat, I soon after procured a piece of that composition which melts in boiling water; and having charged 60 square feet of coated glass, I received the explosion with it, and found three concentric circles; the outermost of which was not quite so far from the next to it, as that was from the innermost. All the space within the first circle was melted; but the space was very well defined, and by no means like a central spot, which in this case was quite obliterated. The appearance of these three concentric circles is represented Plate CLXXVII. fig. 75. n^o 3. The distance at which the discharge was made occasioned no difference in the diameter of these circular spots. When, by putting a drop of water upon the brass rod communicating with the inside of the battery, I made the discharge at the distance of two inches; the spot was just the same as if it had been received at the distance of half an inch. *i. e.* about a quarter of an inch in diameter. Attempting to send an electric

shock over the surface of quicksilver or melted lead. I found that it would not pass; though neither of the rods with which the discharge was made touched the metals. A dark impression was made on the surfaces of both the quicksilver and the lead of the usual size of the circular spot; and remained very visible notwithstanding the state of fusion in which the metals were."

§ 4. *The Electric Fluid moves through the Substance of Electrics, though with difficulty. In most Cases, it passes over the Surface of good Conductors.*

THIS will appear from a consideration of the phenomena above mentioned, and some others. The electric most universally present is *air*. That the fluid pervades its substance is evident to our eye-sight; for if a pointed body is placed on the prime conductor, and at the same time the cylinder is briskly turned, a continual stream of blue fire will be observed to issue from the point. This is undoubtedly the fluid itself made visible by the resistance it meets with from the air. That the electric fluid in this case pervades the air to a considerable distance, is also evident from the different methods by which the air of a room may be electrified. One method is that above mentioned: One or more needles are fixed on the prime conductor, which is kept strongly electrified for about 10 minutes. If, afterwards, an electrometer is brought into the room, the air will show that it has received a considerable quantity of electricity; for the balls will separate, and continue to do so even after the apparatus has been quite removed out of the room. Another method of electrifying the air is to charge a large jar and insulate it; then connect a sharp-pointed wire, or a number of them, with the knob of the jar and make a communication from the outside coating to the table. If the jar is charged positively, the air of the room will likewise soon become electrified positively; but if the jar is charged negatively, the air will also become negative. To this it may be replied, that the air is always full of conducting substances, and that by means of them the electricity is propagated from one part of the air to another. But whether this is the case or not, it is certain that the air, notwithstanding all the conducting substances it may contain, is in fact an electric, and capable of receiving a charge like glass or any other electric substance. To this purpose there is a very curious experiment made in the following manner. Take two plates of smooth boards, of a circular form, and each about three

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Methods of
electrifying
the air of a
room.

feet in diameter. Coat one side of each with tin-foil, which should be pasted down and burnished, and turned over the edge of the board. These boards must be both insulated, parallel to one another, in a horizontal position. They must be turned with their coated sides towards each other; and should be placed in such a manner as to be easily moved to or from each other; to do which, it will be proper to fix to one of the boards a strong supporter of glass or baked wood, and to suspend the other by silk strings from the ceiling of the room; from which it may be lowered at pleasure by means of a pulley. When these boards are placed in the manner above described, and about an inch distant from one another, they may be used exactly as the coatings of a pane of glass. If a spark is given from the conductor to the upper board, a spark will

Theory.

instantly be discharged from the lower one, if any conducting substance is presented to it. By continuing to give sparks to the upper board, and to take them from the lower one, the air between them will at last become charged like a piece of glass; and if a communication is made between them, they will explode, give the shock, &c. like glass.

In this experiment it seems impossible to deny that the air is penetrated by electric fluid. The distance of an inch is so small, that it must appear ridiculous to say that this space is penetrated only by a *repulsive power*, when in other cases we plainly feel the fluid penetrating it to three or four times that distance. The flat surface of the boards indeed makes the motion of the electric fluid through the plate of air gradual and equal, so that it is not seen to pass in sparks or otherwise; but this is necessary to its receiving a charge, as will be afterwards explained.

If one electric substance is penetrable by the electric fluid, we must be led strongly to suspect at least, that all the rest are so too. That resin, pitch, sealing-wax, &c. are so, hath been already proved; and from thence, if we reason analogically, we must conclude, that glass is likewise penetrable by it. A very strong additional proof of this is, that the electric shock cannot be sent over the surface of glass. If this substance was altogether impenetrable to the fluid, it is natural to think, that it would run over the surface of glass very easily. But instead of this, so great is its propensity to enter, that a shock sent through between two glass plates, if they are pressed pretty close together, always breaks them to pieces, and even reduces part of them to a powder like sand. This last effect cannot be attributed to any other cause than the electric fluid entering the pores of the glass; and, meeting with resistance, the impetus of its progressive motion violently forces the vitreous particles asunder in all directions.

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Accounts
of globes
burst
by electrical
operations.

To this violent impetus of the electric fluid, when once it is set in motion, we may also with some probability ascribe the bursting of electric globes, both such as are made of glass, and other materials, in the act of excitation. Dr Priestley hath given several instances of this accident. "The fragments (says he) have been thrown with great violence in every direction, so as to be very dangerous to the bystanders. This accident happened to Mr Sabbatelli in Italy, Mr Nollet in France, Mr Berand at Lyons, Mr Boze at Wittemberg, Mr Le Cat at Rouen, and Mr Boze at Rennes. The air in the inside of Mr Sabbatelli's globe had no communication with the external air, but that of the Abbe Nollet had. This last, which was of English flint glass, had been used for more than two years, and was above a line thick. It burst like a bomb in the hands of a servant who was rubbing it, and the fragments, none of which were above an inch in diameter, were thrown to a considerable distance. The Abbe says, that all the globes which were burst in that manner, exploded after five or six turns of the wheel; and he ascribes this effect to the action of the electric matter making the particles of glass vibrate in a manner he could not conceive.

"When Mr Berand's globe burst (and he was the first to whom this accident was ever known to happen), he was making some experiments in the dark on the

8th of February 1750. A noise was first heard as of something rending to pieces; then followed the explosion; and when the lights were brought in, it was observed that those places of the floor which were opposite to the equatorial diameter of the globe were strewn with smaller pieces, and in greater numbers, than those which were opposite to other parts of it. This globe had been cracked, but it had been in constant use in that state above a year; and the crack had extended itself from the pole quite to the equator. The proprietor ascribed the accident to the vibrations of the glass, and thought the crack had some way impeded these vibrations. When Mr Boze's globe broke, he says that the whole of it appeared, in the act of breaking, like a flaming coal. Mr Boulanger says, that glass globes have sometimes burst like bombs, and have wounded many persons, and that their fragments have even penetrated several inches into a wall. He also says, that if globes burst in whirling by the gun-barrel's touching them, they burst with the same violence, the splinters often entering into the wall. The Abbe Nollet had a globe of sulphur which burst as he was rubbing it with his naked hands, after two or three turns of the wheel, having first cracked inwardly. It broke into very small pieces, which flew to a great distance, and into a fine dust; of which part flew against his naked breast, where it entered the skin so deep, that it could not be got off without the edge of a knife."

From these appearances we must necessarily conclude, not only that the electric fluid moves within the substance of electric bodies, but that it sometimes moves with extreme violence; so that its repulsive power separates even the minutest particles from each other; and this could not happen without a thorough penetration of the electric body. It seems more difficult to prove, that the electric matter does not generally pass directly through the substance of metals, but over their surface. A little consideration, however, will show, that this must very probably be the case. If we compare Dr Priestley's experiments on metals related in § 3. with the effects of the solar light collected in the focus of a burning-glass upon the same metals, we shall find a considerable degree of resemblance. Under the article *BURNING-GLASS*, it is observed, that, notwithstanding the prodigious power of that concave mirror with which Mr Macquer melted platina, all bodies did not melt equally soon in the focus. In particular, polished silver, though a very fusible metal, did not melt at all. It is not to be doubted, that this was owing to the complete reflection of the light by the silver; and had polished pieces of all the metals been tried, it is equally certain, that the difficulty of melting them would have been found exactly proportioned to their reflective power. Something like this happened with Dr Priestley; for silver was less touched by the electric explosion than any other metal. The violent progressive motion of the fluid indeed forced it into the metal, but at the same time the reflective power of the silver hindered it from going so deep as it had done in the others. The case was still more evident when melted lead and quicksilver were used. These have a very great reflective power; and though by reason of the extreme violence wherewith the fluid struck them, part of their substance might naturally

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Proofs of
the electric
fluid's passing
over
the surface.
of conductors.

Theory.

have been supposed to be diffipated in the hard metals, yet we find this was not the case. Only a black spot was made on the surface, and the fluid was immediately dispersed, most probably over the surface of the metal.

It is not indeed easy to bring a decisive proof in favour of this hypothesis. The extreme subtilty, and, in most cases, invisibility, of the electric fluid, render all reasoning about its motions precarious. It is incredible, however, that this fluid should pass through the very substance of metallic bodies, and not be in the least retarded by their solid particles. In those cases, where the solid parts of metals are evidently penetrated, i. e. when wires are exploded, there is a very manifest resistance; for the parts of the wire are scattered about with violence in all directions. The like happened in Dr Priestley's circles made on smooth pieces of metal. Part of the metal was also dispersed and thrown off, for the circular spots were composed of little cavities. If therefore the fluid was dispersed throughout the substance; and not over the surface of the metal, it is plain, that a wire whose diameter was equal to one of those circular spots, ought also to have been destroyed by an explosion of equal strength sent through it. But this would not have been the case. A wire whose diameter is equal to one of those circular spots represented in n^o 1, 2, 3, fig. 75. Plate CLXXVII. would without injury conduct a shock much greater than any battery hitherto constructed could give. It is most probable therefore, that though violent flashes of electricity, which act also as fire, will enter into the substance of metals and consume them; yet it immediately disperses itself over their surface, without entering the substance any more, till being forced to collect itself into a narrow compass it again acts as fire.

In many cases, the electric fluid will be conducted very well by metals reduced to a mere surface, so that we can scarce say they have any thickness at all. A piece of white paper will not conduct a shock without being torn in pieces, as it is an electric substance. But a line drawn upon it with a black-lead pencil will safely convey the charge of several jars. It is impossible we can think that the fire here passes through the substance of the black-lead stroke. It must run over its surface; and if we consider some of the properties of metals, we shall find, that there is very great reason for believing that their conducting power lies at their surface.

The metals are, of all terrestrial substances, those which reflect the light most powerfully. Sir Isaac Newton hath shown that this reflective power they have not from their substance as metals, but from what he calls a *repulsive power*, spread equally over their surface. The existence of this repulsive power hath already been taken notice of in several instances, particularly in that of a chain, whose links cannot be brought into contact with each other without a considerable degree of force. It is exceedingly probable, that the repulsive power by which the links of the chain are kept asunder, and that by which the rays of light are reflected, are one and the same. As the electric fluid is known to pervade all substances, and metals as well as others, it seems also probable, that the repulsive and reflective power on the substance of metals is no other than the electric fluid itself in a quiescent

N^o 112.

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state. Perhaps it may be thought absurd to ascribe the reflection of light to a substance of such extreme fluidity and tenuity as the electric fluid is; but we find that the vacuum of an air-pump, a medium of nearly equal tenuity with the electric fluid (as will elsewhere be proved), is in some cases capable of reflecting light very powerfully. Now it is certain, that nothing can be supposed to give such an easy passage to the electric fluid as itself; because it is the thinnest and most subtle of all the substances we know, and therefore must make the least resistance. Hence the fluid slides over the surface of a piece of metal with surprising ease; and when a large surface of metal is electrified, the effect is proportionable to the extent of it, because all that quantity of electric fluid which is spread over the surface, easily receives the motion communicated by the electric machine.

The vacuum of an air-pump is found to be a very good conductor, and by means of it the motion of the fluid is rendered visible. Hence this is brought as an argument that the electric fluid *always* passes through the substance of conductors. That it doth so in some cases is indeed very evident, but it then meets with considerable resistance; and, even in the present instance, the passing through the vacuum of an air-pump, where it is opposed by a considerable quantity of the same kind of fluid, gives such a considerable resistance, that it will prefer a passage along a metalline rod to one through a vacuum. With regard to charcoal, and other conductors of that kind, as they are very porous, and likewise composed of fine spiculae, it is probable the fluid may run along the surface of the spiculae, and at the same time through the substance of the coal. Even in passing over the best conductors, however, this fluid meets with some resistance, as it will prefer a short passage through the air to a long one through the best conductors.

§ 5. *The exceeding great Velocity and Strength of the Electric Fluid are not owing to a repulsive Power among its Particles, but to the mutual Action of the Air and Electric Fluid upon themselves and one another.*

THE arguments for a repulsive power existing between the particles of the electric fluid are very inconclusive. Some of them have been already taken notice of. The strongest is that drawn from the appearance of the electric fire issuing from a point, or from any body highly electrified. In the open air this diverges excessively; and very often divides into several distinct rays, which by avoiding each other seem to be violently repulsive. That they are not so in reality, however, is plain from the appearance they have in *vacuo*; when, the resistance of the atmosphere being taken off, the electric light would have room to spread more widely. Fig. 27. Plate CLXXIV. represents an exhausted receiver with an electrified wire discharging a stream of this fluid from itself, by means of its communication with a machine. If the electric matter then was really elastic, or endowed with a power repulsive of itself, it is impossible it could pass in an uninterrupted column through an exhausted receiver as in the figure. A column of air, if blown swiftly through the orifice of a small pipe, will go forward a considerable way, if it is counterbalanced by air like itself on every side. But if such a column enters a vacuum,

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Electric fluid shown
to be not
repulsive of
itself.

what

Theory.

Theory.

what we call its *elasticity*, occasions it to be diffused in a moment, and equally diffused through the whole exhausted receiver. But this by no means happens to the electric fluid; for even the small divergency represented in the figure seems entirely owing to some quantity of air left in the air-pump. Dr Watson, by means of a long bent tube of glass filled with mercury, and inverted, made all the bended part which was above the mercury the most perfect vacuum that could be made. This vacuum he insulated; and one of the basons of mercury being made to communicate with the prime conductor, when some non-electric substance touched the other, the electric matter pervaded the vacuum in a continued arch of lambent flame, and, as far as the eye could follow it, without the least divergency. From these experiments it appears, that there is in the vacuum of an air-pump, as well as in the Torricellian vacuum, a fluid of nearly the same density with the electric one: that the electric fluid is not repulsive of itself, but is resisted by the atmosphere; and therefore all appearances of electrical light are less bright *in vacuo* than in the open air; because, the more resistance the matter meets with, the brighter is the flash.

Thus, as long as a stream of electric fluid is moved through a medium of an equal density with itself, the equable pressure of the fluid all round will keep the luminous streams from diverging; but if the pressure is taken off from any part of the receiver, the pressure of the rest will immediately force the stream to that place, as represented fig. 28. That it is by a pressure of this kind, and not by any obscure *attractive power*, that this is occasioned, will be rendered very probable from the following example. Suppose a pot or kettle is boiling violently over a fire, and in such a situation that there is very little agitation in the surrounding air. The equal pressure of the atmosphere will then force the steam straight upwards in a cylindrical column; but if any object is brought near the edge of the pot, so that the pressure of the atmosphere is taken off on one side, the steam will be directly forced upon that body, or seemingly attracted by it. The electric matter therefore, being capable of having its motions resisted by the air, must immediately fly to that place where the resistance is least; but in the case above mentioned, this is best done by applying a conducting substance to the side of the receiver, or one along which the fluid can run downward to the earth. This, however, will more fully explained when we speak of the phenomena of the Leyden phial.

From this simple principle, *viz.* that fluids impelled by any force will always tend towards that place where there is the least resistance, most of the phenomena of electricity may be explained. The first thing to be considered is, From what source it originally derives the astonishing agility and strength displayed in its motions. If it is granted that the electric fluid is the same with the solar light, the ultimate cause of its momentum must be the power by which the light of the sun is emitted. As this power extends through regions of space which to our conceptions are truly *infinite*, so must the power itself be; and it is plain, that by its equable action all round, throughout the whole space thro' which the sun's light is propagated, the pressure of it upon all bodies must be equal all round, and con-

sequently it can neither move them one way nor another. But if, by the intervention of some other power, the pressure is lessened upon any particular part, a current of electric matter will set towards that part, with a force exactly proportioned to the diminution of the pressure. Thus, in the common experiments of the air-pump, when the air is exhausted from a glass vessel, the pressure of the superincumbent atmosphere is directed towards every part of the glass; so that if it is of a flat square shape, and not very strong, it will certainly be broken. But after the air is exhausted, the vessel is discovered to be full of another subtle fluid of the same nature with the electric one *. If this could also be extracted from the vessel, the pressure on its sides would necessarily be much greater, because not only the atmosphere, but the whole surrounding ether or electric matter, would urge towards the place; and it is not probable, that this pressure could be resisted by any terrestrial power whatever. The momentum of the electric matter therefore, in our experiments, depends on two causes, *viz.* the pressure of the atmosphere upon the electric matter, and the pressure of one part of this matter upon another. The celerity with which it moves may be explained from its parts lying in contact with each other throughout the wide immensity of space. Hence the great tendency of the fluid to circulate; because, from whatever point a stream of it is sent off, there the pressure is lessened, and the stream, finding no place empty for its reception, must necessarily have a tendency to return to the place from whence it came, as there it meets with the least resistance; and hence, when a passage is opened for it, by which it can return to this point, it is urged thither with great violence, the equable pressure is restored, and the artificial motion ceases.

§ 6. *The Manner in which an Electric Substance becomes excited, or diffuses its Electric Virtue.*

THIS will easily appear from considering the means taken for the excitation of a common cylinder for electric experiments. The glass is a substance, as we have already seen, into which the electric matter is very apt to enter. To the surface of the glass is applied some amalgam spread on leather. This is a metallic substance which has an exceeding great reflective power, being that which is employed for silverizing looking-glasses. The electric fluid therefore runs over its surface with great ease, and there is always a certain quantity of this fluid in a state of stagnation on its surface. At the place where the cylinder touches the amalgam, the air is excluded, and consequently the electric fluid hath there a tendency to rise more than at any other part of the surface where the atmosphere presses with its full force. When the cylinder begins to turn, it necessarily forces before it a small quantity of that electric matter which lay upon the surface of the amalgam. To understand this the more easily, we must consider that property which glass has of transmitting the electric fluid through it, and refusing it a passage along its surface. Thus we may conceive it to be formed of a vast number of exceedingly small tubes placed close to each other. If we suppose any substance made by art of such a texture, we would find it impossible to pour water along its surface, though it would very easily run through it. If such a substance

Plate CLXXIV.

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Origin of the prodigious power of electricity.

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was made in the shape of a cylinder, and turned briskly round, with its surface just touching a quantity of water contained in a vessel, the consequence would be, that the water would be scattered around in all directions. The case seems to be the same with the more subtle electric fluid. The glass cylinder throws out part of the electric fluid lying on the surface of the amalgam. This quantity is perpetually renewed from the conducting side of the rubber. The quantity which is thrown out cannot be conducted over the surface of the glass, nor can it pass through it; because it is resisted by the air in the inside, and, in some measure, by the glass itself. It is also resisted by the air on the outside; but as that resistance is less than what is made by the air and glass both put together, the fluid naturally forces itself into the open air. Still, however, there neither is, nor can be, any accumulation of the matter itself. It cannot enter the air without displacing the electric matter which was there before. This will displace more of the same kind, and so on, till at last the motion is communicated to the electric matter lodged in some part of the earth. From thence it is propagated to the rubber of the electric machine, and thus a kind of circulatory motion is carried on. By the excitation of an electric substance, therefore, the fluid is not accumulated, but only set in motion. The reason of that seeming accumulation observable about the excited cylinder is, the resistance which the fluid meets with from the air. This instantly produces a divergency in the stream of electric matter, and a vibratory struggle betwixt it and the air; which again produces the appearances of fire and light, for the reasons already given.

TOO
Proofs of
the vibratory motion
of an electric fluid.

That this kind of vibratory motion or struggle between the electric fluid and air always takes place when the latter is set in motion seems evident from the sensation which is felt when a strongly excited electric is brought near any part of the human body. This is such as would be occasioned by a spider's web drawn lightly along the skin, or rather by a multitude of small insects crawling upon the body. It is, however, more clearly proved by an experiment made by Dr Priestley. He was desirous to know whether the electric fluid was concerned in the freezing of water or not. For this purpose, he exposed two dishes of water to the open air in the time of a severe frost. One of them he kept pretty strongly electrified; but could observe no difference in the time either when it began to freeze, which was in about three minutes, or in the thickness of the ice, when both had been frozen for some time. Happening to look out at the window through which he had put the dishes, he observed on each side of the electrified wire the same dancing vapour which is seen near the surface of the earth in a hot day, or at any time near a body strongly heated.

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Why an exhausted cylinder can not be excited;

If the glass cylinder which we want to excite is exhausted of air, the electric matter, instead of flying off into the air, runs directly through the glass; and, meeting with some resistance from the vacuum as it is called, a weak light is produced in the inside, but no signs of electricity are perceived on the outside of the glass. The same thing happens by giving the cylinder or tube a metallic coating. The fluid collected from the rub-

ber runs directly through the glass, and along the surface of the metallic coating, which keeps off the pressure of the air contained in the glass. If an electric lining is used, and the glass is exhausted of air, the motion of the fluid becomes visible through both, and the whole is transparent, as already observed. If the cylinder is lined with an electric substance, and the air is not exhausted, the electricity on the outside is often considerably increased; but the reason of this is not evident. Most probably it is owing to the different kind of electricity acquired by the inside lining; for electricity of any kind always produces its opposite at a small distance, the reason of which shall be afterwards given.

If the air within the cylinder is condensed, the electrical appearances on the outside are lessened in proportion. The reason of this seems to be, that though it is necessary that the fluid should not go through the substance of the glass very easily, yet it is requisite that its passage should not be totally obstructed; and therefore the electric experiments succeed best when the air within the glass is a little rarefied. We must also consider, that when an additional quantity of air is forced into the cylinder, an equal bulk of electric matter is forced out. The rest of the matter, therefore, which is contained all round the glass, presses violently into its pores; but this pressure, being directly opposite to what happens when the glass is excited, must of consequence hinder the excitation. If the glass is now made very hot, the pressure of the atmosphere is kept off, and the passage of the electric fluid through the glass and condensed air is rendered easier, and therefore the electric appearances on the outside return.

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Nor one filled with condensed air.

On the same principles may we explain the excitation of a solid stick of glass, sealing-wax, or sulphur. Though these have no air within them, yet they have a very considerable quantity of electric matter, which resists an expulsion from its place: and therefore, though it may yield a little when the rubber is applied to the outside, yet it will instantly throw off into the atmosphere what the rubber has left on the surface; because the resistance is least towards that place, as soon as the electric has come out from under the rubber. Hence also we see the reason why no signs of electricity are observed on glass to which the rubber is immediately applied; namely, because the pressure being equally great all round, no part of the electric fluid can be thrown off into the atmosphere, in order to set the rest in motion.

The only thing necessary to be added in confirmation of this theory of excitation is, that electric substances of the same kind cannot be excited by rubbing them against one another. Thus glass cannot be excited by rubbing it against glass, &c. Mr Wilcke observed, that when two pieces of glass were rubbed upon each other in the dark, a very vivid light appeared upon them; which, however, threw out no rays, but adhered to the place where it was excited. It was attended with a strong phosphoreal smell, but no attraction or repulsion. From this experiment he inferred, that friction alone would not excite electricity; but that to produce this effect, the bodies rubbed together must be of different natures with respect to their attracting the electric fluid.

Theory.

Theory.

§ 7. Of Positive and Negative Electricity.

FROM what hath been already advanced, it will pretty plainly appear, that to increase the quantity of electric fluid in any body is a thing impossible, unless we also augment the size of the body. All the fine pores of every terrestrial fluid are exceedingly full, and unless we separate the minutest particles of the body farther from one another than they are naturally, we cannot introduce more of the electric fluid into it than there was before. This fluid, we have already seen, is not, like the air, endued with a repulsive force between its particles; and therefore it must be incompressible. If it is incompressible, all the phenomena attending it must be owing to its various motions, and the seeming accumulations of it must be owing only to its more brisk action in some places than in others. But before a complete solution of the phenomena of positive and negative electricity can be given, it is necessary to show that these are not so essentially distinct and opposite as they have been thought to be, but may be converted into each other in such cases as we cannot possibly suppose either an addition or subtraction of the electric fluid.

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Methods of charging positive and negative electricity into one another.

This position, however opposite to the common opinions on the subject, may be proved by the following experiments. 1. Let a coated phial be set upon an insulating stand, and let its knob be touched by the knob of another phial negatively electrified. A small spark will be observed between them, and both sides of the insulated phial will instantly be electrified negatively. Now, though we may suppose the one side of the phial which is touched by the negatively electrified one to lose part of its fire, yet this cannot be the case with the other, because there is nothing to take it away, and therefore it ought to appear in its natural state. 2. Let a phial, having a pith-ball electrometer fastened to its outside coating, be slightly charged positively, and then set upon an insulating stand. The outside is then negatively electrified, or, according to Dr Franklin's theory, has too little electric matter in it. The pith-balls, however, will touch each other, or separate but in a very small degree; but let the knob of another bottle, which hath received a strong charge of positive electricity, be brought near to the knob of the first, and the pith-balls on the outside will diverge with positive electricity. Now, it is impossible that any substance can have both too much and too little electric matter at the same instant: yet we see that negative electricity may thus instantaneously be converted into the positive kind, in circumstances where no addition of fire to the outside can be supposed. 3. Let the same phial, with the pith-balls affixed to its outside coating, be slightly charged negatively, and then insulated. The outside is now electrified positively, or, according to Dr Franklin's hypothesis, has too great a quantity of electric fluid. Nevertheless, upon bringing the knob of a phial strongly electrified negatively to that of the insulated one, the pith-balls will instantly diverge with negative electricity. 4. Let a phial receive as full a charge of positive electricity as it can contain, and then insulate it. Charge another very highly with negative electricity. Bring the knob of the negative bottle near that of the positive one, and a thread will play briskly between them. But when

the knobs touch each other, the thread after being attracted will be repelled by both. The negative electricity is somehow or other superinduced upon the positive; and, for a few moments after the bottles are separated, both will seem to be electrified negatively. But if the finger is brought near the knob of that bottle on which the negative electricity was superinduced, it will instantly be dissipated, a small spark strikes the finger, and the bottle appears positively charged as before.

From these metamorphoses of positive into negative, or negative into positive, electricity, it seems proven in the most decisive manner, that positive electricity doth not consist in an accumulation, nor the negative kind in a deficiency, of the electric fluid. We are obliged, therefore, to adopt the only probable supposition, namely, that both of them arise entirely from the different directions into which the fluid is thrown in different circumstances; and of consequence, the only method of giving an intelligible explanation of positive and negative electricity is by considering the different direction of the fluid in each.

A great variety of methods have been contrived to ascertain the direction of the electric fluid, but all of them seem uncertain except that which is drawn from the appearance of electric light. The luminous matter appearing on a point negatively electrified is very small, resembling a globe; it makes little noise, and has a kind of hissing sound. The positive electricity, on the other hand, appears in a diverging luminous stream, which darts a considerable way into the air, with a crackling noise. Now, it is certain, that in whatever case the electric fluid darts from the point into the air, in that case it must be the most resisted by it; and this is evident in the positive electricity. In this, the rays evidently diverge from the points. We may, indeed, suppose them to be converging from many points in the surrounding air towards the metallic point. But why should we imagine that a visible ray would break out from one place of the atmosphere more than another? The air, we know, resists the motion of the electric fluid, and it certainly must resist it equally. Of consequence, when this fluid is coming from the air towards a pointed conductor, it must percolate slowly and invisibly through the air on all sides equally, till it comes so near that it is able to break through the intermediate space; and as this will likewise be equal, or nearly so, all round, the negative electricity must appear like a steady luminous globe on the point, not lengthening or shortening by flashes as the positive kind does. Electricians have therefore determined with a great deal of reason, that when a point is electrified positively the matter flows out from it.

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Method of determining the direction of the fluid.

It is to be remarked, however, that in most cases, if not in all, a body cannot be electrified negatively till it has first become positively electrified; and it is in the act of discharging its positive electricity that it becomes negative. Thus, suppose a coated phial to be set upon an insulated stand, and its knob is approached by that of another bottle charged positively: a small spark is observed between them, and both sides of the insulated bottle are electrified positively; but as soon as the finger is brought near to the outside, the positive electricity is discharged by a spark, and a negative one appears. But from what hath been already advanced,

Theory.

it is evident, that positive electricity is when the fluid hath a tendency to leave any body, and the negative electricity when it hath the same tendency to enter it. Therefore, as the electric fluid is subject to mechanical laws as well as other fluids, it must follow, that these tendencies are produced and kept up by the motions excited originally in the air, and electric fluid in the air, surrounding these bodies. If this principle is kept in view, it will lead us to an easy explanation of many electrical phenomena, for which no satisfactory reason hath hitherto been given.

§ 8. Of Electric Attraction and Repulsion.

It hath now been shown, that, in bodies electrified positively, there is a flux of electric matter from their surface all round; that is, the fluid contained in their pores pushes out on every side, and communicates a similar motion to the electric fluid contained in the adjacent atmosphere. This must of necessity very soon exhaust the body of its electric matter altogether, if it was not instantaneously supplied after every emission. But this supply is immediately procured from the surrounding atmosphere. The quantity sent off is instantly returned from the air, and the vibratory motion or struggle between the air and electric fluid, which hath been often mentioned, immediately takes place. The positive electricity therefore consists in a vibratory motion in the air and electric fluid; and the force of this vibration is directed outwards from the electrified body. In bodies negatively electrified, the fluid contained in the neighbouring atmosphere is directed towards the body so electrified. But it is certain, that this motion inwards cannot be continued unless there is also a motion of the fluid outwards from the body. In this case also there is a vibratory motion, but the force of it is directed inwards, and as the source of it lies not in the body, but in the surrounding atmosphere, it manifests itself somewhat less vigorously.

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Why electric appearances continue so long.

The reason why these motions are continued for such a length of time as we see they are, is, the extreme mobility of the electric fluid. It doth not indeed appear from any experiments, that this fluid hath the least friction among its parts. A motion once induced into it must therefore continue for ever, until it is counteracted by some other motion of the same fluid. Hence, when a vibratory motion is once introduced among the particles of the electric fluid contained in any substance, that motion will be kept up by the surrounding fluid, let the body be removed to what place we please. There is no occasion indeed for supposing any thing like an electric atmosphere round the electrified body. The case is exactly the same as with a burning body. Let a candle be carried to what place we will, it will still burn; but it would be absurd to say, that the fire surrounded it like an atmosphere, as we know the fire is kept up by the air only, which is changed every moment. In like manner, the positive and negative electricities, which are two different motions of the electric fluid, are kept up by the air and electric matter contained in it; and, wherever the electrified body is carried, these fluids are equally capable of continuing them.

The phenomena of attraction and repulsion are now easily explained. Let us suppose a body positively electrified suspended by a small thread, at a distance

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from any other. The vibration above-mentioned, in which positive electricity consists, being kept up by the equable pressure on all sides, the body is neither moved to one side nor another. But when a negatively electrified body is brought near, the force of the vibration being directed outwards in the one, and inwards in the other, the pressure of the fluid in the intermediate space between them is greatly lessened; and of consequence the pressure on the other sides drives them together, and they are said to *attract* each other. If another body, electrified also positively, is brought near to the first, the force of the vibrations are directly opposed to one another, and therefore the bodies recede from each other, and are said to *repel* one another. The case is the same with two bodies negatively electrified: for there the electricity, as far as it extends round the bodies, consists of a vibratory motion of the electric fluid; and the vibrations being directed towards both the bodies, as towards two different centres, must necessarily cause them recede from each other; because, if they remained in contact, the vibratory motions would interfere with and destroy one another.

When a small body is brought within the sphere of another's electricity, the equable pressure of that vibratory or electrical sphere is somewhat lessened upon the side near which the second body is brought; and therefore it is immediately impelled towards the first by the action of the surrounding fluid, in order to keep up the equilibrium. As soon as it arrives there, the vibrations of the fluid around the first body being communicated to that within the pores of the second, it immediately acquires a sphere of electricity as well as the first, and is consequently repelled. The repulsion continues till the vibration ceases either by the action of the air, or by the body coming in contact with another much larger than itself; in which case the electricity is said to be *discharged*. If, after this discharge of electricity, the second body is still within the electric sphere of the first, it will immediately be attracted, and very soon after repelled, and so on alternately till the electricity of the former totally ceases.

§ 9. Of the Discharge of Electricity by Sparks upon blunt Conductors, and silently by pointed Ones.

The manner in which this is accomplished will best appear from considering the nature of what is commonly called *electricity*. This cannot appear but in an electric substance; and the substance in which it doth appear is the air. The prime conductor of an electrical machine discovers no other properties in itself, when electrified, than it had before. The metal is equally hard, shining, and impenetrable. The electricity, or properties of attracting, repelling, &c. are all lodged in the air; and if the conductor is placed in *vacuo*, they instantly cease. It hath already been shown, that the electric matter runs over the surface of conducting substances in great quantities, like a stream of water running from one place to another. In this manner it will not pass over the surface of electrics. It enters their substance, and passes through it with a vibratory motion. This vibratory motion always shows a resistance; nor is it in any case possible to induce a vibration without first impressing a motion in one direction, and then resisting it by a contrary motion.

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Electricity only shows itself in the air.

Theory. Round the surface of an electrified body suspended in the air, therefore, there is always an equable pressure, by which the emission of the electric fluid is every moment checked, and by which its vibrations are occasioned. When a metallic substance is brought near the electrified body, the fluid has an opportunity of making its escape, provided it could get at the metal, because it could run along its surface. The pressure of the air is also lessened on that side which the conducting substance approaches. The whole effort of the electric matter contained in the vibratory sphere is exerted against that single place, because the resistance is least. If the body has a broad surface, however, the disproportion between these resistances is not so great as when its surface is less. Let us suppose, for instance, that the surface of the conducting substance contains an inch square, and that the whole surface of the electrified sphere contains only six square inches. When the conducting substance approaches, all the pressure is directed towards that place; and the effort made by the electric matter to escape there, is five times as great as what it is any where else. Nevertheless, though it has a vibratory motion in the substance of the air, it cannot have a progressive motion through it without violently displacing its parts; and an inch square of air makes a considerable resistance. At last, however, if this resistance is every moment made less by approaching the conducting substance nearer to the electrified body, the electric matter breaks through the thin plate of air, strikes the conductor, and runs along it. The spark is produced by the resistance it meets with from the air. But if, instead of a body with a broad surface, we present the point of a needle, whose surface is perhaps not above the ten-thousandth part of a square inch, the effort of the electric matter to discharge itself there will be 60,000 times greater than at any other place, because the whole effort of the six square inches, of which we suppose the surface of the electric sphere to consist, is exerted against that single point. The air also resists, as in the former case; but it can resist only in proportion to the extent of its surface which covers the conducting body; and this, being only the ten-thousandth part of a square inch, must be exceedingly little. As soon therefore as a needle, or any other fine pointed body, is presented to an electrified substance, the electric matter is urged thither with great velocity; and as it hath an opportunity of running along the needle, its vibrations quickly cease, and the electricity is said to be *drawn off*.—This drawing off, however, does not extend all round the electrified body, if means are used to keep up the electricity perpetually. Thus, if, on the end of the prime conductor, there are fastened a number of fine threads, hairs, &c. when the cylinder is turned, the threads on the end will diverge, and spread out like as many rays proceeding from a centre. If a point is presented on one side of the conductor, though at a considerable distance, the threads on one side will lose their divergence and hang down, but those on the other side will continue to diverge. The reason of this is, the difficulty with which the electric fluid gets through the atmosphere, even where the resistance of it is made as little as possible; and hence also we may see why more conductors than one may be necessary for the safety of large buildings. See LIGHTNING.

§ 10. *Why Positive Electricity hath a Tendency to induce the Negative Kind on any Body kept within its Sphere of Action, and why Negative Electricity produces the Positive Kind in similar Circumstances.*

This is one of the electrical phenomena most difficult to be solved; and indeed seems totally insolvable, unless we give up the idea of a *accumulation and deficiency* of the electric fluid in different bodies. On Dr Franklin's principles, no solution hath been attempted. Mr Cavallo places this among the *properties* of electricity for which he doth not pretend to account, but gives as the *causes* of other phenomena. It is indeed certain, that if a body hath already *too much* electricity or any thing else, it cannot be continually taking from those around it; and if it hath *too little*, it cannot be continually giving them. By attending to the principles above laid down, however, this phenomenon admits of an easy solution. As positive electricity consists in a vibratory motion of the electric matter in the pores of any body, and to some distance through the air, while at the same time the force is directed outwards from the body, it is plain, that if any other body is brought within this sphere, the direction of the vibration is changed; for what is *outwards* from the one is *inwards* to the other. But a vibratory motion, the force of which is directed *inwards*, is what constitutes negative electricity; and, therefore, no sooner is any body placed at some distance from one positively electrified, than it immediately becomes negatively so. The same reason may be given why negative electricity produces the positive kind on a body placed near it. In the negative kind, the force of the vibration is directed *inwards*. If another body is brought near, the vibration which is *inwards* to the first must be *outwards* from the second, which thus becomes positively electrified. The only difficulty here, is to account for this motion, which is only inward or outward to one side of the body brought near the electrified one, being so suddenly propagated all round. This, however, must easily be seen to arise from the extreme subtilty of the electric fluid, and its effort to keep up an equilibrium in all parts, which it will never suffer to be broken. When this fluid pushes inward to one side of a body, the fluid contained in that body would immediately yield, and allow a free passage to what came after, if its yielding was not obstructed by something on the other side. This obstruction arises from the air, which cannot admit a progressive motion of electric matter through it. No sooner, therefore, is a push made against one side than a contrary one is made against the other; and thus the body instantly becomes electrified all round.

On these principles, also, may we account for the *Zones* of positive and negative electricity which are to be found on the surface of glass tubes*; and especially negative electricity in electrified air. When the prime conductor of a machine is strongly electrified positively, it is throwing out the fluid from it in all directions. The air cannot receive this fluid without throwing out that which it also contains; and this shows, that simple electrification can neither increase nor diminish the density of the air, which is also vouched by numberless experiments. But if the air throws out its electric fluid in all directions, it must throw part of it back upon the conductor.

Theory.

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Why a motion of the fluid on one side is suddenly propagated round a body.

108
Zones of positive and negative electricity accounted for. See n^o 69.

Theory.

tor, and consequently obstruct its operations. This likewise is found to be the case; for it is impossible to make an electric machine act long with the same degree of strength, owing to the electricity communicated from it to the air. But if the conductor and air are thus reciprocally throwing the electric matter back upon one another, it is impossible but another zone of air which lies at a greater distance must be continually receiving it, or be electrified negatively. But this cannot receive, without also emitting the fluid it contains; which, therefore, will be thrown upon another zone behind it, and partly back upon the first. The original force of the fluid being now spread over a large space, will consequently be diminished; and the succeeding zone will be electrified weakly, though positively. In like manner, a succeeding zone must yield, and receive the fluid from this; which will consequently be electrified negatively, though weaker than the former: and thus zones of positive and negative electricity will gradually succeed each other in the air, till no traces of either are to be found.—In these zones, it must be remembered, that there is a centre peculiar to each, and from this centre the vibrations proceed either inward or outward. Thus, when the machine is first set in motion, a vibration is propagated from it as from a centre to some distance in the air, and the air is at first negatively electrified. But as this vibratory motion cannot be extended far in one direction, vibrations begin to be propagated in all directions from another centre at some distance. The conductor becomes then less positively electrified than before; however, by means of the machine, its electricity is still kept up, though weaker; but a zone of air beyond the first, where the resistance is much less, becomes negatively electrified. This again cannot continue long till vibrations outwards arise from another centre, and so on. It is scarce needful to add here, that the longer the electrification is continued, and the stronger it is, the broader these zones must be.

§ 11. Of the Leyden Phial.

THE phenomena of the Leyden phial are easily explained from what hath been already advanced. Glass and other electric substances are so constituted, that they can transmit the vibratory motions of the electric matter, though they cannot admit of any considerable progressive one. Conducting substances, on the other hand, admit of a progressive motion, but not so easily of a vibratory one. When the electric fluid is procured from the earth by an electric machine, if the conductor had a communication with the earth, all the matter collected by the cylinder would run along the conductor into the earth, and not a spark or other appearance of electricity would be procured in the air. But when the conductor is insulated, the matter is forced to go off into the air, and there produces the vibratory motions already mentioned. If a pane of glass which has no metallic coating touches the conductor, though it is permeable by the vibratory motion of the fluid, yet a considerable resistance is made, and the fluid cannot easily diffuse itself over its surface. Nevertheless, it will soon show signs of having received electricity, that is, of having the fluid within its pores thrown into a vibratory motion. This motion is directed outwards, from the middle of the

substance of the glass, to the surface, and a considerable way beyond it on both sides. Both sides of the glass are then positively electrified. If a conducting substance touches one of the sides of the glass, the vibrations on that side are destroyed; because the fluid which occasioned them yields to the resistance it met with, and runs along the conductor into the earth. But no sooner is this done, than the power which refilled the vibration outward from the glass having got the better in the manner just now explained, a new vibration is produced by that refilling power; and the force of this vibration is directed towards the side from whence the electricity was drawn off, which therefore becomes electrified negatively. Thus may we understand how a pane of glass, or any other electric, may receive positive electricity on the one side and negative on the other, to as high a degree as we please. But there is found to be a limit to every charge of electricity we can give; and this limit is the resistance of the air. A phial will contain double the charge in air doubly condensed than it does in the common atmosphere; and when once the vibration becomes too great to be borne, the positive side of the glass throws out pencils of light, and will receive no more electricity in that state of the atmosphere.

Thus, in every charged phial, there is a violent impulse or vibration of the fluid, outward from the positive, and inward to the negative, side. As long as these continue, the phial continues charged. As the electric fluid seems to be subject to no other natural power, but controls all its own actions only by moving in opposite directions, it is plain, that if a charged phial is carefully kept from any of those means by which it is known to be discharged, it must keep its charge for a long time; and thus, by keeping phials within glass cases, their charge will be retained for six or eight weeks, or perhaps a great deal longer. The only method of discharging a phial, is by making a communication between its coatings. The fluid pressing out of the positive side, now yields to the pressure of that from the negative side, and runs along the conductor. But no sooner does it come near the negative side of the phial, than, meeting with more of the same kind, the current of which is directed the same way, both together break through the air with a violent flash and crack, and all appearances of electricity cease. — In this, as in all other electrical experiments, it is easy to see, that the force, velocity, &c. of the fluid depends entirely on the pressure of that which surrounds us. Nature hath appointed a certain constitution or modification of the electric fluid in all terrestrial bodies, and likewise all round the earth. In our electrical experiments, we violate this constitution in some degree. When this violation is but small, the powers of nature operate gently in repairing the disorder we have introduced; but when any considerable deviation is occasioned, the natural powers restore the original constitution with extreme violence.

§ 12. The Phenomena of the Electrophorus accounted for.

THE electrophorus is a machine represented Plate CLXXVII. fig. 74. It consists of two plates, A and B, usually of a circular form; though they may be made square, or of the figure of a parallelogram, with more ease, and with equal advantage. At first the under plate was

Theory.

109
In what manner a phial becomes charged.

110
Why it retains its charge.

111
Reason of its discharge.

Theory.
112
Construc-
tion of the
electropho-
rus.

of glass, covered over with sealing-wax; but there is little occasion for being particular either with regard to the substance of the lower plate, or the electric which is put upon it. A metallic plate, however, is perhaps preferable to a wooden one, though the latter will answer the purpose very well. This plate is to be covered with some electric substance. Pure sulphur answers very new as well as the dearer electrics, sealing-wax, gum-lac, &c.; but it hath this bad quality, that, by rubbing it, some exceeding subtle steams are produced, which infect the person's clothes, and even his whole body, with a very disagreeable smell, and will change silver in his pocket to a blackish colour.—The upper plate of the electrophorus is a brass plate, or a board or piece of pasteboard covered with tin-foil or gilt paper, nearly of the same size with the electric plate, though it will not be the worse that it is somewhat larger. It is furnished with a glass handle (I), which ought to be screwed into the centre. The manner of using this machine is as follows. First, the plate B is excited by rubbing its coated side with a piece of new white flannel, or a piece of hare's skin. Even a common hard shoe-brush, having the hair a little greased, will excite sulphur extremely well. When this plate is excited as much as possible, it is set upon the table with the electric side uppermost. Secondly, the metal plate is laid upon the excited electric, as represented in the figure. Thirdly, the metal plate is touched with the finger or any other conductor, which, on touching the plate, receives a spark from it. Lastly, the metal plate A, being held by the extremity of its glass handle (I'), is separated from the electric plate; and, after it is elevated above that plate, it will be found strongly electrified with an electricity contrary to that of the electric plate; in which case, it will give a very strong spark to any conductor brought near it. By setting the metal upon the electric plate, touching it with the finger, and separating it successively, a great number of sparks may be obtained apparently of the same strength, and that without exciting again the electric plate. If these sparks are repeatedly given to the knob of a coated phial, it will presently become charged.

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Mr Cavallo's ob-
servations.

“As to the continuance of the virtue of this electric plate (says Mr Cavallo), when once excited, without repeating the excitation, I think there is not the least foundation for believing it perpetual, as some gentlemen have supposed; it being nothing more than an excited electric, it must gradually lose its power by imparting continually some of its electricity to the air, or other substances contiguous to it. Indeed its electricity, although it could never be proved to be perpetual by experiments, lasts a very long time, it having been observed to be pretty fresh several days, and even weeks, after excitation. The great duration of the electricity of this plate, I think, depends upon two causes: first, because it does not lose any electricity by the operation of putting the metal plate upon it, &c. and, secondly, because of its flat figure, which exposes it to a less quantity of air, in comparison with a stick of sealing-wax, or the like, which, being cylindrical, exposes its surface to a greater quantity of air, which is continually robbing the excited electrics of their virtue.

“The first experiments that I made, relative to this

machine, were with a view to discover which substance would answer best for coating the glass plate, in order to produce the greatest effect. I tried several substances either simple or mixed; and at last I observed, that the strongest in power, as well as the easiest, I could construct, were those made with the second sort of sealing-wax, I spread upon a thick plate of glass. A plate that I made after this manner, and no more than six inches in diameter, when once excited, could charge a coated phial several times successively, so strongly as to pierce a hole through a card with the discharge. Sometimes the metal plate, when separated from it, was so strongly electrified, that it darted strong flashes to the table upon which the electric plate was laid, and even into the air, besides causing the sensation of the spider's web upon the face brought near it, like an electric strongly excited. The power of some of my plates is so strong, that sometimes the electric plate adheres to the metal when this is lifted up, nor will they separate even if the metal plate is touched with the finger or other conductor. It is remarkable, that sometimes they will not act well at first, but they may be rendered very good by scraping with the edge of a knife the shining or glossy surface of the wax. This seems analogous to the well-known property of glass, which is, that new cylinders or globes, made for electrical purposes, are often very bad electrics at first; but that they improve by being worked, *i. e.* by having their surface a little worn. Paper also has this property.

“If, after having excited the sealing-wax, I lay the plate with the wax upon the table, and the glass up-¹¹⁴perments wide-
permoist, *i. e.* contrary to the common method; then, the electro-
phorus.
on making the usual experiments of putting the metal plate on it, and taking the spark, &c. I observe it to be attended with the contrary electricity: that is, if I lay the metal plate upon the electric one, and, while in that situation, touch it with an insulated body, that body acquires the positive electricity; and the metallic, removed from the electric plate, appears to be negative; whereas it would become positive, if laid upon the excited wax. This experiment, I find, answers in the same manner if an electric plate is used which has the sealing-wax coating on both sides, or one which has no glass plate.

“If the brass plate, after being separated from, be presented with the edge toward the wax, lightly touching it, and thus be drawn over its surface, I find that the electricity of the metal is absorbed by the sealing-wax, and thus the electric plate loses part of its power; and if this operation is repeated five or six times, the electric plate loses its power entirely, so that a new excitation is necessary in order to revive it.

“If, instead of laying the electric plate upon the table, it is placed upon an electric stand, so as to be accurately insulated, then the metal plate set on it acquires so little electricity, that it can only be discovered with an electrometer; which shows, that the electricity of this plate will not be conspicuous on one side of it, if the opposite side is not at liberty either to part with or acquire more of the electric fluid. In consequence of this experiment, and in order to ascertain how the opposite sides of the electric plate would be affected in different circumstances, I made the following experiments.

“Upon an electric stand E, (Plate CI. XXVII. fig. 74.)

Theory.

I placed a circular tin-plate, nearly six inches in diameter, which by a slender wire H communicated with an electrometer of pith-balls G, which was also insulated upon the electric stand F. I then placed the excited electric plate D of six inches and a quarter in diameter, upon the tin-plate, with the wax uppermost; and on removing my hand from it, the electrometer G, which communicated with the tin-plate, *i. e.* with the under side of the electric plate, immediately opened with negative electricity. If, by touching the electrometer, I took that electricity off, the electrometer did not afterwards diverge. But if now, or when the electrometer diverged, I presented my hand open, or any other uninsulated conductor, at the distance of about one or two inches, over the electric plate, without touching it, then the pith-balls diverged; or, if they diverged before, came together, and immediately diverged again with positive electricity:—I removed the hand, and the balls came together;—approached the hand, and they diverged: and so on.

"If, while the pith-balls diverged with negative electricity, I laid the metal plate, holding it by the extremity K of its glass handle, upon the wax, the balls came, for a little time, towards one another, but soon opened again with the same, *i. e.* negative electricity.

"If, whilst the metallic rested upon the electric plate, I touched the former, the electrometer immediately diverged with positive electricity; which if, by touching the electrometer, I took off, the electrometer continued without divergence.—I touched the metal plate again, and the electrometer opened again; and so on for a considerable number of times, until the metal plate had acquired its full charge. On taking now the metal plate up, the electrometer G instantly diverged with strong negative electricity.

"I repeated the above-described experiments, with this only difference in the disposition of the apparatus, *i. e.* I laid the electric plate D with the excited sealing-wax upon the circular tin-plate, and the glass uppermost; and the difference in their result was, that where the electricity had been positive in the former disposition of the apparatus, it now became negative, and *vice versa*; except that, when I first laid the electric plate upon the tin, the electrometer G diverged with negative electricity, as well in this as in the other disposition of the apparatus.

"I repeated all the above experiments with an electric plate, which, besides the sealing-wax coating on one side, had a strong coat of varnish on the other side, and their result was similar to that of those made with the above-described plate."

This is Mr Cavallo's account of the electrophorus; but there is one part of it in which he must certainly be mistaken. He tells us, that "if instead of laying the electric plate upon the table, it is set upon an electric stand, so as to be accurately insulated, then the metal plate set on it acquires so little electricity, that it can only be discovered by an electrometer." In what manner this gentleman came to mistake a plain fact so egregiously, is not easy to determine; but it is certain, than an electrophorus, instead of having its virtue impaired by being insulated, has it greatly increased, at least the sphere of its activity is greatly enlarged. When lying on the table, if the upper plate is put upon it without being touched with the finger,

it will not show much sign of electricity. But as soon as it is put on the electric stand, both the upper and under side appear strongly negative. A thread will be attracted at the distance of eight or ten inches. If both the upper and under side are touched at the same time, a strong spark will be obtained from both, but always of the same kind of electricity, namely, the negative kind. If the upper plate is now lifted up, a strong spark of positive electricity will be obtained from it; and on putting it down again, two sparks of negative electricity will be produced.

The singularity of this experiment is, that it produces always double the quantity of negative electricity that it doth of the positive kind; which cannot be done by any other method yet known. Another very surprising circumstance is, that when the electrophorus remains in its insulated situation, you need not always touch the upper and under side of the plates at once, in order to procure positive electricity from the upper plate: It is sufficient to touch both sides only once. On lifting up the upper plate, a spark of positive electricity is obtained as already mentioned. On putting it down again, a spark of the negative kind is obtained from the upper plate, even though you do not touch the lower one. On lifting up the upper plate, a spark of positive electricity is obtained, but weaker than it would have been had both sides been touched at once. Putting down the upper plate again without touching both, a still weaker spark first of negative and then of positive electricity will be obtained from the upper one. Thus the sparks will go on continually diminishing, to the number perhaps of two or three hundred. But at last, when the electricity of the whole machine seems to be totally lost, if both sides are touched at once, it will instantly be restored to its full strength, and the double spark of negative, with the single one of positive electricity, will be obtained without intermission as before.

To account for all these phenomena very particularly, is perhaps impossible, without a greater degree of knowledge concerning the internal fabric of bodies than we have access to attain. In general, however, it is evident, that the phenomena of the electrophorus arise from the disposition that the electric matter hath to keep up an equilibrium within itself throughout every part of the universe. In consequence of this, no motion of the electric matter can be produced upon the one side of a body, but it must immediately be balanced by a corresponding one on the opposite side; and in proportion to the strength of the one, so will the strength of the other be. When the under plate of the electrophorus is excited, the negative electricity or vibratory action of the electric matter towards the excited side, is produced; and the moment that such an action is produced on one side, it is resisted by a similar one on the opposite side, and thus the electrophorus becomes negatively electrified on both sides. As long as the under part of the machine communicates with the earth, the vibratory motion is impeded by the progressive one towards the earth. This makes the resistance on the under side less, and therefore the vibratory motion on the upper part extends but a small way. When the plate is insulated, the electric matter has not an opportunity of escaping to the earth as before, because it is strongly resisted by the air; a vibration

Theory.

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Singular
appearance
on insulating
an electrophorus.

117
General
reason of
all the phenomena.

115
Mistakes in
Mr Cavallo's observations.

Method of
using the
Electrical
Apparatus,
&c.

bration therefore takes place on both sides, and extends to a great distance from the plate. When the upper plate is set upon the electrophorus, the same kind of electricity, *viz.* the negative kind, is communicated to it. When both sides are touched with the finger, or with any other conducting substance, both electricities are suddenly taken off, because the electric matter running along the conducting substance on both sides, puts an end to the vibratory motion in the air, which constitutes the very essence of what we call *electricity*. There is now a quiet and equal balance of the electric matter on both sides, and therefore no signs of electricity are shown. But as soon as the upper plate is taken off, this balance is destroyed. The fluid in the metal plate had not been able to penetrate the electric substance in such a manner as to put a stop to the vibrations of what was within it. As soon then as the plate is taken off, the electricity or vibratory motion towards the electric breaks out at that side. But this motion *inwards* to the electric, which constitutes negative electricity, necessarily becomes *outward* from the plate; and as no motion of the fluid can be produced on one side of a body, but what is immediately communicated to the other, the upper plate becomes electrified positively, and the under one negatively on both sides.

SECT. VII. *Of the Method of using the Electrical Apparatus already described, with some practical Rules for performing Experiments with it to the best Advantage.*

THE machines already described are calculated for exhibiting the phenomena of electricity in a very high degree; and in general the following effects may be expected from them.

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Appearances on
exciting the
electric cy-
linder.

1. On whirling the cylinder in contact with the rubber, without bringing any conducting body near the former, or insulating the latter, we will perceive in the dark a stream of fire seemingly issuing from the place of contact between the rubber and cylinder, and adapting itself to the form of the cylinder so as to involve it in a blue flame mixed with bright sparks; the whole making a very perceptible whizzing and snapping noise. If the finger is brought near the cylinder in this situation, the flame and sparks will leave the cylinder and strike it; and this phenomenon will continue as long as the globe is whirled round.

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On adding the
prime
conductor.

2. On applying the prime conductor, the light will in a great measure vanish, and be perceptible only upon the points presented by it to the cylinder: but if the finger is now brought near the conductor, a very smart spark will strike it, and that at a greater or smaller distance according to the strength of the machine. This spark, when the electricity is not very strong, appears like a straight line of fire; but if the machine acts very powerfully, it will put on the appearance of zig-zag lightning, throwing out other sparks from the corners, and strike with such force as to give consider-

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able pain to those who receive it. These sparks in certain circumstances will set fire to spirits, tinder, gunpowder, &c.

Method of
using the
Electrical
Apparatus,
&c.

3. If instead of the hand or any part of the human body, we hold the knob of a coated phial near the conductor, a vast number of sparks will appear between them, first with a loud snapping noise, but gradually diminishing until at last it ceases, and pencils of blue flame intermixed with small sparks will be thrown out by the phial; and if the latter is still kept near the conductor, it will in a little time discharge itself with a violent flash and crack; after which, if the phial has not been broke by the discharge, the sparks from the conductor will begin as before, and the same phenomena be repeated as long as the cylinder is turned, or till the phial breaks.

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Method of
drawing
sparks.

4. On applying the battery, though the accumulation of electricity be much greater than in a single phial, the signs of it are much less apparent; and sparks will always pass between the conductor and knob leading to the battery, by reason of the great evaporation from the latter into the air. But here, if one of the jars discharges itself, all the rest are likewise discharged in the same moment, and some of them generally broken.

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On apply-
ing the
battery,
&c.

5. A thread or other light body suspended near the conductor will be attracted at a considerable distance; and the force of attraction will be greater or less according to the power of the machine.

6. The electricity in all cases will be positive if the rubber be not insulated, and negative if it is so: and by Mr Nairne's contrivance of having a conductor connected with the insulated rubber, and another with the cylinder, both kinds of electricity may be had with equal ease.

All these phenomena are the more remarkable in proportion to the power of the machine. That used the great in Teyler's museum is the strongest of which we have yet heard; and its effects are as follow.

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Effects of
the great
machine in
Teyler's
museum.

On presenting a very sharp steel point to the prime conductor, a luminous stream of about half an inch was perceived between them. On fixing the point to the conductor so as to project three inches from it, streams of light were thrown out from the point six inches long when a ball of three inches in diameter was presented, but only two inches in length on presenting another point.

The sensation called the *spider's web* on the face of the bystanders (b) is often felt at the distance of eight feet from the prime conductor. A thread six feet long was sensibly attracted at the distance of 30 from the prime conductor, and a pointed wire appeared luminous at the distance of 28 feet; a cork-ball electrometer diverged at the distance of 40 feet.

A single spark from the conductor melted a considerable length of gold-leaf; gunpowder and other combustibles, inclosed in a paper cartridge, with a sharp point in the middle, were fired; and when another conductor communicating with the earth was placed at the distance of 21, or sometimes 24 inches

3 N from

(b) This is a kind of sensation always produced by strong electricity, something resembling the creeping of insects or the motion of a light body, such as a spider's web, over the skin, as already mentioned. It seems to proceed from the attraction and electrification of the small hairs with which the body is covered.

Method of
using the
Electrical
Apparatus,
&c.

from the prime conductor of the machine, a stream of fire was perceived between them. This was crooked, and darting out many lateral brushes of a very large size, in the manner already mentioned. A Leyden phial, containing about one square foot of coated surface, was fully charged by about half a turn of the winch so as to discharge itself; and by repeated trials it was found, that in one minute it discharged itself 76, 78, and frequently 80 times. Lastly, it was found, that though the conductor, which received the sparks from the prime one of the machine, communicated with the earth by a wire $\frac{1}{16}$ ths of an inch in diameter, this wire would give small sparks to any conducting body brought near it, as if even this wire had not been sufficient to conduct the quantity of electricity it received from the machine very readily to the earth.

Though these effects are not to be expected from our ordinary electrical machines, yet it is certain, that by taking proper care of them they will be found to act much more powerfully than if neglected. The following directions therefore will be found useful for such as wish to make electrical experiments.

1. The first thing to be observed is, the preservation and care of the instruments. The electrical machine, the coated jars, and in short every part of the electrical apparatus, should be kept clean, and as free as possible from dust and moisture.

2. When the weather is clear, and the air dry, especially in clear and frosty weather, the electrical machine will always work well. But when the weather is very hot, the electrical machine is not so powerful; nor in damp weather, except it be brought into a warm room, and the cylinder, the stands, the jars, &c. be made thoroughly dry.

3. Before the machine be used, the cylinder should be first wiped very clean with a soft linen cloth that is dry, clean, and warm; and afterwards with a clean hot flannel, or an old silk handkerchief: this done, if the winch be turned when the prime conductor and other instruments are removed from the electrical machine, and the knuckle be held at a little distance from the surface of the cylinder, it will be soon perceived, that the electric fluid comes like a wind from the cylinder to the knuckle; and, if the motion be a little continued, sparks and crackling will soon follow. This indicates that the machine is in good order, and the electrician may proceed to perform his experiments. But if, when the winch is turned for some time, no wind is felt upon the knuckle, then the fault is, very likely, in the rubber: and to remedy that, use the following directions: By loosening the screws on the back of the rubber, remove it from its glass pillar, and keep it a little near the fire, so that its silk part may be dried; take now a dry piece of mutton suet, or a little tallow from a candle, and just pass it over the leather of the rubber; then spread a small quantity of the above described amalgam over it, and force it as much as possible into the leather. This done, replace the rubber upon the glass pillar; let the glass cylinder be wiped once more, and then the machine is fit for use.

4. Sometimes the machine will not work well because the rubber is not sufficiently supplied with electric fluid; which happens when the table, upon which the machine stands, and to which the chain of the rubber is

connected, is very dry, and consequently in a bad conducting state. Even the floor and the walls of the room are, in very dry weather, bad conductors, and they cannot supply the rubber sufficiently. In this case the best expedient is, to connect the chain of the rubber, by means of a long wire, with some moist ground, a piece of water, or with the iron work of a water-pump; by which means the rubber will be supplied with as much electric fluid as is required.

5. When a sufficient quantity of amalgam has been accumulated upon the leather of the rubber, and the machine does not work very well, then, instead of putting on more amalgam, it will be sufficient to take the rubber off, and to scrape a little that which is already upon the leather.

6. It will be often observed, that the cylinder, after being used some time, contracts some black spots, occasioned by the amalgam, or some foulness of the rubber, which grow continually larger, and greatly obstruct its electric power. These spots must be carefully taken off, and the cylinder must be frequently wiped in order to prevent its contracting them.

7. In charging electric jars in general, it must be observed, that not every machine will charge them equally high. That machine whose electric power is the strongest, will always charge the jars highest. If the coated jars, before they are used, be made a little warm, they will receive and hold the charge the better.

8. If several jars are connected together, among which there is one that is apt to discharge itself very soon, then the other jars will soon be discharged with that; although they may be capable of holding a very great charge by themselves. When electric jars are to be discharged, the electrician must be cautious, lest by some circumstance not adverted to, the shock should pass through any part of his body; for an unexpected shock, though not very strong, may occasion several disagreeable accidents. In making the discharge, care must be taken that the discharging rod be not placed on the thinnest part of the glass, for that may cause the breaking of the jar.

9. When large batteries are discharged, jars will be often found broken in it, which burst at the time of the discharge. To remedy this inconvenience, Mr Nairne says, he has found a very effectual method, which is, never to discharge the battery through a good conductor, except the circuit be at least five feet long. Mr Nairne says, that ever since he made use of this precaution, he has discharged a large battery near a hundred times without ever breaking a single jar, whereas before he was continually breaking them. But here it must be considered, that the length of the circuit weakens the force of the shock proportionably; the highest degree of which is in many experiments required.

10. It is advisable, when a jar, and especially a battery, has been discharged, not to touch its wires with the hand, before the discharging rod be applied to its sides a second and even a third time; as there generally remains a residuum of the charge, which is sometimes very considerable.

11. When any experiment is to be performed which requires but a small part of the apparatus, the remaining part of it should be placed at a distance from the

Method of
using the
Electrical
Apparatus,
&c.

Fig. 34.



Fig. 33.

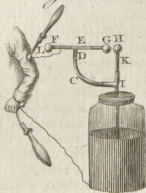


Fig. 32.



Fig. 31.



Fig. 30.



Fig. 29.



Fig. 38.



Fig. 37.

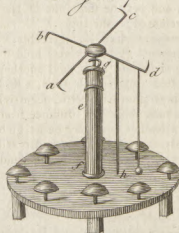


Fig. 36.

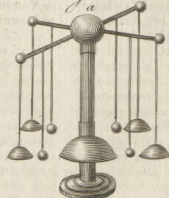


Fig. 35.

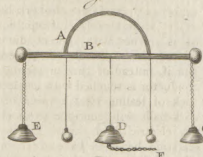


Fig. 43.

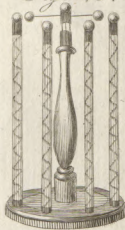


Fig. 40.



Fig. 39.



Fig. 41.

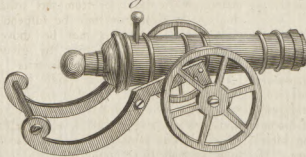


Fig. 42.

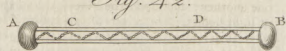


Fig. 50.



Fig. 48.



Fig. 46.



Fig. 44.

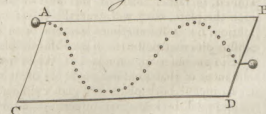


Fig. 51.

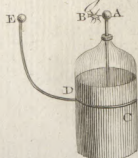


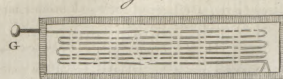
Fig. 49.



Fig. 47.



Fig. 45.



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machine, the prime conductor, and even from the table, if that is not very large. Candles, particularly, should be placed at a considerable distance from the prime conductor, for the effluvia of their flames carry off much of the electric fluid.

SECT. VIII. Entertaining Experiments.

I. The Electrified Cork-ball Electrometer.

Fix at the end of the prime conductor a knobbed rod, and hang on it two small cork-balls suspended by threads of equal length. The balls will now touch one another, the threads hanging perpendicularly, and parallel to each other. But if the cylinder of the machine be whirled by turning the winch, then the cork-balls will repel one another; and more or less according as the electricity is more or less powerful.—If the electrometer be hung to a prime conductor negatively electrified, *i. e.* connected with the insulated rubber of the machine, the cork-balls will also repel each other. If, in this state of repulsion, the prime conductor is touched with some conducting substance not insulated, the cork-balls will immediately come together. But if, instead of the conducting substance, the prime conductor is touched with an electric, as for instance a stick of sealing-wax, a piece of glass, &c. then the cork-balls will continue to repel each other; because the electric fluid cannot be conducted through that electric: hence we have an easy method of determining what bodies are conductors and what electrics. This electrical repulsion is also shown by a large downy feather, or fill more agreeably by the representation of a human head with hair, as shown fig. 47. for there the electric repulsion will make the hair erect itself in a strange manner. If the feather is used, it will appear beautifully swelled by the divergency of its down.

II. Attraction and Repulsion of light Bodies.

CONNECT with the prime conductor, by means of the hook *H*, the two parallel brass plates *F*, *G*, as represented in fig. 38. at about three inches distance from one another; and upon the lower plate put any kind of light bodies, as bran, bits of paper, bits of leaf-gold, &c.; then work the machine, and the light bodies will soon move between the two plates, leaping alternately from one to the other with great velocity. If, instead of bran or irregular pieces of other matter, small figures of men or other things cut in paper and painted, or rather made of the pith of alder, be put upon the plate, they will generally move in an erect position, but will sometimes leap one upon another, or exhibit different postures, so as to afford a pleasing spectacle to an observing company. When bran or other substances of that kind are made use of, it will be proper to inclose both plates in a glass cylinder, by which the bran will be kept from dispersing and flying about the room.

The phenomena of electric attraction and repulsion may be represented also with a glass tube, or a charged bottle, and some of them in a manner more satisfactory than with the machine.

III. The Flying-feather, or Shuttle-cock.

TAKE a glass tube (whether smooth or rough is not material); and after having rubbed it, let a small light

feather be let out of your fingers at the distance of about eight or nine inches from it. This feather will be immediately attracted by the tube, and will flick very close to its surface for about two or three seconds, and sometimes longer; after which time it will be repelled; and if the tube be kept under it, the feather will continue floating in the air at a considerable distance from the tube, without coming near it again, except it first touches some conducting substance; and if you manage the tube dexterously, you may drive the feather through the air of a room at pleasure.

There is a remarkable circumstance attending this experiment; which is, that if the feather be kept at a distance from the tube by the force of electric repulsion, it always presents the same part towards the tube:—You may move the excited tube about the feather very swiftly, and yet the same side of the feather will always be presented to the tube.

This experiment may be agreeably varied in the following manner: A person may hold in his hand an excited tube of smooth glass, and another person may hold an excited rough glass tube, a stick of sealing-wax, or in short another electric negatively electrified, at about one foot and a half distance from the smooth glass tube: a feather now may be let go between these two differently excited-electrics, and it will leap alternately from one electric to the other; and the two persons will seem to drive a shuttle-cock from one to the other by the force of electricity.

IV. The Electric Well.

PLACE upon an electric stool a metal quart mug, or some other conducting body nearly of the same form and dimension; then tie a short cork-ball electrometer, at the end of a silk thread proceeding from the ceiling of the room, or from any other support, so that the electrometer may be suspended within the mug, and no part of it may be above the mouth: this done, electrify the mug by giving it a spark with an excited electric or otherwise; and you will see that the electrometer, whilst it remains in that insulated situation, even if it be made to touch the sides of the mug, is not attracted by it, nor does it acquire any electricity; but if, whilst it stands suspended within the mug, a conductor, standing out of the mug, be made to communicate with or only presented to it, then the electrometer is immediately attracted by the mug.

THE following experiments require to be made in the dark: for although the electric light in several circumstances may be seen in the day-light, yet its appearance in this manner is very confused; and that the electrician may form a better idea of its different appearances, it is absolutely necessary to perform such experiments in a darkened room.

V. The Star and Pencil of Electric Light.

WHEN the electrical machine is in good order, and the prime conductor is situated with the collector sufficiently near the glass cylinder, turn the winch, and you will see a lucid star at each of the points of the collector. This star is the constant appearance of the electric fluid that is entering a point. At the same time you will see a strong light proceeding from the rubber,

Plate
CLXXV.

Entertaining Experiments.

rubber, and spreading itself over the surface of the cylinder; and if the excitation of the cylinder is very powerful, dense streams of fire will proceed from the rubber, and, darting round almost half the circumference of the cylinder, will reach the points of the collector. If the prime conductor is removed, the dense streams of fire will go quite round the cylinder; reaching from one side of the rubber to the other. If the chain of the rubber is taken off, and a pointed body, as for instance the point of a needle or a pin, is presented to the back of the rubber, at the distance of about two inches, a lucid pencil of rays will appear to proceed from the point presented, and diverge towards the rubber. If another pointed body be presented to the prime conductor, it will appear illuminated with a star; but if a pointed wire or other pointed conducting body be connected with the prime conductor, it will throw out a pencil of rays.

VI. Drawing Sparks.

LET the prime conductor be situated in its proper place, and electrify it by working the machine; then bring a metallic rod with a round knob at each end, or the knuckle of a finger, within a proper distance of the prime conductor, and a spark will be seen between that and the knuckle or knobbed wire. The longer and stronger spark is drawn from that end of the prime conductor which is farthest from the cylinder, or rather from the extremity of the knobbed rod fixed at its end; for the electric fluid seems to acquire an impetus by going through a long conductor, when electrified by a powerful machine. This spark appears like a long line of fire, reaching from the conductor to the opposed body, and often (particularly when the spark is long, and different conducting substances are near the line of its direction) it will have the appearance of being bended to sharp angles in different places, exactly resembling a flash of lightning. It often darts brushes of light sideways in every direction.

VII. The Electric Light flashing between two Metallic Plates.

LET two persons, one standing upon an insulated stool, and communicating with the prime conductor, and another standing upon the floor, each hold in one of his hands a metal plate, in such a manner that the plates may stand back to back in a parallel situation, and about two inches asunder. Let the winch of the machine be turned, and you will see the flashes of light between the two plates so dense and frequent, that you may easily distinguish any thing in the room. By this experiment the electric light is exhibited in a very copious and beautiful manner, and it bears a striking resemblance to lightning.

VIII. To fire Inflammable Spirits.

THE power of the electric spark to set fire to inflammable spirits, may be exhibited by several different methods, but more easily thus: Hang to the prime conductor a short rod having a small knob at its end; then pour some spirits of wine, a little warmed, into a spoon of metal; hold the spoon by the handle, and place it in such a manner, that the small knob on the rod may be about one inch above the surface of the spirits. In this situation, if, by turning the winch, a spark be

made to come from the knob, it will set the spirits on fire. It will generally be found more advantageous to fix the dish containing the spirits upon the prime conductor, as represented fig. 48.

This experiment may be varied different ways, and may be rendered very agreeable to a company of spectators. A person, for instance, standing upon an electric stool, and communicating with the prime conductor, may hold the spoon with the spirits in his hand, and another person, standing upon the floor, may set the spirits on fire by bringing his finger within a small distance of it. Instead of his finger, he may fire the spirits with a piece of ice, when the experiment will seem much more surprising. If the spoon is held by the person standing upon the floor, and the insulated person brings some conducting substance over the surface of the spirits, the experiment succeeds as well.

IX. The artificial Bolognian Stone illuminated by the Electric Light.

THE most curious experiment to show the penetrability of the electric light, is made with the real, or more easily with the artificial, Bolognian stone, invented by the late Mr J. Canton. This phosphorus is a calcareous substance, generally used in the form of a powder, which has the property of absorbing light when exposed to it, and afterwards appearing lucid when brought into the dark*. Take some of this powder, and, by means of spirits of wine or ether, stick it all over the inside of a clear glass phial, and stop it with a glass stopper, or a cork and sealing-wax. If this phial be kept in a darkened room (which for this experiment must be very dark), it will give no light; but let two or three strong sparks be drawn from the prime conductor, when the phial is kept at about two inches distance from the sparks, so that it may be exposed to that light, and this phial will receive that light, and afterwards will appear illuminated for a considerable time. The powder may be stuck upon a board by means of the white of an egg, so as to represent figures of planets, letters, or any thing else at the pleasure of the operator; and the figures may be illuminated in the dark, in the same manner as the above-described phial.

A beautiful method to express geometrical figures with the above phosphorus, is to bend small glass tubes of about the tenth part of an inch diameter, in the shape and figure desired, and then fill them with the phosphorus powder. These may be illuminated in the manner described, and they are not so subject to be spoiled as the figures represented upon the board frequently are. The best method of illuminating this phosphorus, and which Mr W. Canton generally used, is to discharge a small electric jar near it.

X. The Luminous Conductor.

FIG. 24. represents a prime conductor invented Plate by Mr Henley, which shows clearly the direction of the electric fluid passing through it, from whence it is called the luminous conductor. The middle part EF of this conductor is a glass tube about 18 inches long and three or four inches in diameter. To both ends of this tube the hollow brass pieces FD, BE, are cemented air-tight, one of which has a point C, by which

Entertaining Experiments.

* See Chb. 1414.

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which it receives the electric fluid, when set near the excited cylinder of the electrical machine, and the other has a knobbed wire *G*, from which a strong spark may be drawn; and from each of the pieces *F D*, *B E*, a knobbed wire proceeds within the cavity of the glass tube. The brass piece *F D*, or *B E*, is composed of two parts; i.e. a cap *F* cemented to the glass tube, and having a hole with a valve, by which the cavity of the glass tube is exhausted of air; and the ball *D*, which is screwed upon the cap *F*. The supporters of this instrument are two glass pillars fastened in the bottom-board *H*, like the supporters of the prime conductor. When the glass tube of this conductor is exhausted of air by means of an air-pump, and the brass ball is screwed on, as represented in the figure, then it is fit for use, and may serve for a prime conductor to an electrical machine. If the point *C* of this conductor is set near the excited cylinder of the machine, it will appear illuminated with a star; at the same time the glass tube will appear all illuminated with a weak light; but from the knobbed wire that proceeds within the glass from the piece *F D*, a lucid pencil will issue out, and the opposite knob will appear illuminated with a star, which, as well as the pencil of rays, is very clear, and discernible among the other light that occupies the greatest part of the cavity of the tube. If the point *C*, instead of being presented to the cylinder, be connected with the rubber of the machine, the appearance of light within the tube will be reversed; the knob which communicates with the piece *F D* appearing illuminated with a star, and the opposite with a pencil of rays; because in this case the direction of the electric fluid is just the contrary of what it was before; it then going from *D* to *B*, and now coming from *B* and going to *D*. If the wires within the tube *E F*, instead of being furnished with knobs, be pointed, the appearance of light is the same; but it seems not so strong in this as in the other case.

XI. The Conducting Glass Tube.

TAKE a glass tube of about two inches diameter, and about two feet long; fix to one of its ends a brass cap, and to the other a stop-cock or a valve; then, by means of an air-pump, exhaust it of air. If this tube be held by one end, and its other end be brought near the electrified prime conductor, it will appear to be full of light whenever a spark is taken by it from the prime conductor, and much more so if an electric jar be discharged through it. This experiment may also be made with the receiver of an air-pump: take, for instance, a tall receiver, clean and dry; and through a hole at its top insert a wire, which must be cemented airtight. The end of the wire that is within the tube must be pointed, but not very sharp; and the other end must be furnished with a knob. Put this receiver upon the plate of the air-pump, and exhaust it. If now the knob of the wire at the top of the receiver be touched with the prime conductor, every spark will pass through the receiver in a dense and large body of light, from the wire to the plate of the air-pump. When any thing is to be touched with the prime conductor that is not very portable, as the air-pump above mentioned, the communication between the former and the latter may be made by means of a rod furnished with an electric handle, or the like.

XII. The Aurora Borealis.

TAKE a phial nearly of the shape and size of a Florence flask; fix a stop-cock of a valve to its neck, and exhaust it of air as much as possible with a good air-pump. If this glass is rubbed in the common manner used to excite electrics, it will appear luminous within, being full of a flashing light, which plainly resembles the aurora borealis or northern light. This phial may also be made luminous, by holding it by either end, and bringing the other end to the prime conductor; in this case, all the cavity of the glass will instantly appear full of flashing light, which remains in it for a considerable time after it has been removed from the prime conductor. Instead of the above-described glass vessel, a glass tube exhausted of air and hermetically sealed may be used, and perhaps with better advantage. The most remarkable circumstance of this experiment is, that if the phial, or tube, after it has been removed from the prime conductor (and even several hours after its flashing light hath ceased to appear), be grasped with the hand, strong flashes of light will immediately appear within the glass, which often reach from one of its ends to the other.

XIII. The Visible Electric Atmosphere.

G I, fig. 26, represents the receiver with the plate *Plate* of an air-pump. In the middle of the plate *I F*, a *CLXXIV* short rod is fixed, having at its top a metal ball *B* nicely polished, whose diameter is nearly two inches. From the top of the receiver, another rod *A D*, with a like ball *A*, proceeds, and is cemented airtight in the neck *C*; the distance of the balls from one another being about four inches, or rather more. If, when the receiver is exhausted of air, the ball *A* be electrified positively, by touching the top *D* of the rod *A D* with the prime conductor, or an excited glass tube, a lucid atmosphere appears about it, which although it consists of a feeble light, is yet very conspicuous, and very well defined; at the same time, the ball *B* has not the least light. This atmosphere does not exist all round the ball *A*; but reaches from about the middle of it, to a small distance beyond that side of its surface which is towards the opposite ball *B*. If the rod with the ball *A* be electrified negatively, then a lucid atmosphere, like the above described, will appear upon the ball *B*, reaching from its middle to a small distance beyond that side of it that is towards the ball *A*; at the same time, the negatively electrified ball *A* remains without any light. The operator in this experiment must be careful not to electrify the ball *A* too much; for then the electric fluid will pass in a spark from one ball to the other, and the experiment will not have the desired effect. A little practice, however, will render the operation very easy and familiar.

XIV. Of charging and discharging a Phial in general.

TAKE a coated jar, and place it upon the table near *Plate* the prime conductor, so that the knob of its wire, and *CLXXV* that only, may be in contact with it: fix the quadrant electrometer fig. 15, upon the prime conductor, and then turn the winch of the machine. You will observe, that as the jar is charging, the index of the *3* electrometer.

lectrometer will rise gradually as far as 90°, or thereabouts, and then rest: when this happens, you may conclude that the jar has received its full charge. If now you take a discharging rod, and holding it by the glass handle, apply first one of its knobs to the outside coating of the jar, and then bring the other knob near the knob of the wire of the jar, or near the prime conductor that communicates with it, you will hear a report, and see very vivid sparks between the discharging rod and the conducting substances, communicating with the sides of the jar. This operation discharges the jar. If, instead of using the discharging rod, you touch the outside of the jar with one hand, and bring the other hand near the wire of the jar, the same spark and report will follow; but now you will feel a shock which affects your wrists, elbows, and if strong, your breast also. If a number of persons join hands, and the first of them touches the outside of the jar, and the last touches the wire communicating with the inside, they will all feel the shock, and precisely at the same perceivable time. This shock, bearing no resemblance to any sensation otherwise felt, cannot consequently be described; and in order that a person may form a just idea of it, he must absolutely feel it. A shock may be given to any single part of the body, if that part only be brought into the circuit.

XX. The Leyden Vacuum.

Plate
CLXXIV.

Fig. 22. 23. represent a small phial coated on the outside, about three inches up the sides, with tin-foil; at the top of the neck of this phial, a brass cap is cemented, having a hole with a valve, and from the cap a wire proceeds a few inches within the phial, terminating in a blunt point. When this phial is exhausted of air, a brass ball is screwed upon the brass cap, which is cemented into its neck, so as to defend the valve, and prevent any air from getting into the exhausted glass. This phial exhibits clearly the direction of the electric fluid, both in charging and discharging; for if it be held by its bottom, and its brass knob be presented to the prime conductor positively electrified, you will see that the electric fluid causeth the pencil of rays to proceed from the wire within the phial, as represented fig. 22.; and if it is discharged, a star will appear in the place of the pencil, as represented in fig. 23. But if the phial is held by the brass cap, and its bottom be touched with the prime conductor, then the point of the wire on its inside will appear illuminated with a star when charging, and with a pencil when discharging. If it be presented to a prime conductor electrified negatively, all these appearances, both in charging and discharging, will be reversed.

The apparatus represented fig. 25. will be found very convenient for the various experiments upon the luminous conductor, Leyden vacuum, jars charged positively or negatively, with their different states of insulation. *A* is an insulating pillar of glass, which is screwed to the wooden foot *B*; and on this pillar all the apparatus may be screwed alternately. *CD* is an exhausted tube of glass, furnished at each end with brass caps; at the end *D* is a valve properly secured under the brass plate; a brass wire with a ball projects from the upper cap; a pointed wire proceeds from the bot-

tom plate; and this tube is called the *luminous conductor*. The flask represented at *E* is called the *Leyden vacuum*. It is furnished with a valve under the ball *E*; to come at which the more readily, the ball may be unfcrewed: a wire, with a blunt end, projects to within a little of the bottom of the flask, the latter being coated with tin-foil; and a female screw is cemented to the bottom, in order to screw it on the pillar *A*. *F* is a syringe to exhaust the air occasionally, either from the luminous conductor or the Leyden vacuum. To do this, unfcrew the ball of the Leyden vacuum, or the plate of the luminous conductor, and then screw the syringe in the place of either of these pieces, being careful that the bottom of the female screw *G* bears close against the leather which covers the shoulders *a b c d*; then work the syringe, and in a few minutes the glasses will be sufficiently exhausted. *H* and *I* are two Leyden bottles; each of which has a female screw fitted to the bottom, in order that they may be conveniently screwed on the pillar *A*; and the bottle *H* is furnished with a belt by which it may be screwed side-wise to the same. *K* and *L* are two small wires, to be screwed occasionally either into the ball *E*, the knobs *e* or *f*, the cap *c*, or the socket *g* on the top of the pillar: the balls may be unfcrewed from these wires, which will then exhibit a blunt point. *M* is a wooden table to be screwed occasionally on the glass pillar.

XVI. To pierce a Card and other Substances with the Electric Explosion.

TAKE a card, a quire of paper, or the cover of a book, and keep it close to the outside coating of a charged jar; put one knob of the discharging rod upon the card, quire of paper, &c. so that between the knob and coating of the jar the thickness of that card, or quire of paper, only is interposed; lastly, by bringing the other knob of the discharging rod near the knob of the jar, make the discharge, and the electric matter will pierce a hole (or perhaps several) quite through the card or quire of paper. This hole has a bur raised on each side, except the card, &c. be pressed hard between the discharging rod and the jar; which shows that the hole is not made in the direction of the passage of the fluid, but in every direction from the centre of the resisting body. If this experiment be made with two cards instead of one, which however must be kept very little distant from one another, each of the cards, after the explosion, will be found pierced with one or more holes, and each hole will have burrs on both surfaces of each card. The hole, or holes, are larger or smaller, according as the card, &c. is more damp or more dry. It is remarkable, that if the nostrils are presented to it, they will be affected with a sulphureous, or rather a phosphoreous, smell, just like that produced by an excited electric.

If, instead of paper, a very thin plate of glass, rosin, sealing-wax, or the like, be interposed between the knob of the discharging rod and the outside coating of the jar, on making the discharge, this will be broken in several pieces. Small insects may also be killed in this manner. They may be held between the outside coating of the jar and the knob of the discharging rod, like the above card; and a shock of a common phial sent through them, will instantly deprive them

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of life, if they are pretty small : but if larger, they will be affected in such a manner, as to appear quite dead on first receiving the stroke ; but will, after some time, recover : this, however, depends on the quantity of the charge sent through them.

XVII. *To show the Effect of the Shock sent over the Surface of a Card or other Substances.*

PUR the extremities of two wires upon the surface of a card, or other body of an electric nature, so that they may be in one direction, and about one inch distance from one another ; then, by connecting one of the wires with the outside of a charged jar, and the other wire with the knob of the jar, the shock will be made to pass over the card or other body. If the card be made very dry, the lucid track between the wires will be visible upon the card for a considerable time after the explosion. If a piece of common writing paper be used instead of the card, it will be torn by the explosion into very small bits.

If, instead of the card, the explosion is sent over the surface of a piece of glass, this will be marked with an indelible track, which generally reaches from the extremity of one of the wires to the extremity of the other. In this manner, the piece of glass is very seldom broken by the explosion. But Mr Henley has discovered a very remarkable method to increase the effect of the explosion upon the glass ; which is by pressing with weights that part of the glass which lies between the two wires (*i. e.* that part over which the shock is to pass). He puts first a thick piece of ivory upon the glass, and places upon that ivory a weight at pleasure, from one quarter of an ounce to six pounds : The glass in this manner is generally broken by the explosion into innumerable fragments, and some of it is absolutely reduced into an impalpable powder. If the glass is very thick, and resists the force of the explosion, so as not to be broken by it, it will be found marked with the most lively prismatic colours, which are thought to be occasioned by very thin laminæ of the glass, in part separated from it by the shock. The weight laid upon the glass is always shook by the explosion, and sometimes it is thrown quite off from the ivory. This experiment may be most conveniently made with the universal discharger, fig. 8.

XVIII. *To swell Clay, and break small Tubes, by the Electric Explosion.*

ROLL up a piece of soft tobacco-pipe clay in a small cylinder, and insert in it two wires, so that their ends without the clay may be about a fifth part of an inch from one another. If a shock be sent through this clay, by connecting one of the wires with the outside of a charged jar, and the other with the inside, it will be inflated by the shock, *i. e.* by the spark, that passes between the two wires, and, after the explosion, will appear swelled in the middle. If the shock sent through it is too strong, and the clay not very moist, it will be broken by the explosion, and its fragments scattered in every direction. To make this experiment with a little variation, take a piece of the tube of a tobacco-pipe, about one inch long, and fill its bore with moist clay ; then insert in it two wires, as in the above rolled clay ; and send a shock through it. This tube will not fail to burst by the force of the explosion, and its

fragments will be scattered about to a great distance. If, instead of clay, the above-mentioned tube of the tobacco-pipe, or a glass tube (which will answer as well), be filled with any other substance, either electric or non-electric, inferior to metal, on making the discharge, it will be broken in pieces with nearly the same force. This experiment is the invention of Mr Lane, F. R. S.

XIX. *To make the Electric Spark visible in Water.*

FILL a glass tube of about half an inch diameter, and six inches long, with water ; and to each extremity of the tube adapt a cork, which may confine the water ; through each cork insert a blunt wire, so that the extremities of the wires within the tube may be very near one another ; lastly, connect one of these wires with the coating of a small charged phial, and touch the other wire with the knob of it ; by which means the shock will pass through the wires, and cause a vivid spark to appear between their extremities within the tube. In performing this experiment, care must be taken that the charge be exceedingly weak, otherwise the tube will burst. If we place in a common drinking glass, almost full of water, two knobbed wires, so bent, that their knobs may be within a little distance of one another in the water, and if one of these wires be connected with the outside coating of a pretty large jar, and the other wire be touched with the knob of it ; the explosion which must pass through the water from the knob of one of the wires to that of the other, will disperse the water, and break the glass with a surprising violence. This experiment is very dangerous if not conducted with great caution.

XX. *To fire Gun-powder.*

MAKE a small cartridge of paper, and fill it with gun-powder, or else fill the tube of a quill with it ; insert two wires, one at each extremity, so that their ends within the quill, or cartridge, may be about one fifth of an inch from one another : this done, send the charge of a phial through the wires ; and the spark between their extremities, that are within the cartridge, or quill, will set fire to the gun-powder. If the gun-powder be mixed with steel-filings, it will take fire more readily, and with a very small shock.

XXI. *To strike Metals into Glass.*

TAKE two slips of common window-glass about three inches long, and half an inch wide ; put a small slip of gold, silver, or brass leaf, between them, and tie them together, or else press them together between the boards of the press *H*, belonging to the universal discharger fig. 9. Plate CLXXIV. leaving a little of the metallic leaf out between the glasses at each end ; then send a shock through this metallic leaf, and the force of the explosion will drive part of the metal into so close a contact with the glass, that it cannot be wiped off, or even be affected by the common menstrua which otherwise would dissolve it. In this experiment the glasses are often shattered to pieces ; but whether they are broken or not, the indelible metallic tinge will always be found in several places, and sometimes thro' the whole length of both glasses.

XXII. *To stain Paper or Glass.*

LAY a chain, which forms a part of the circuit between the two sides of a charged jar, upon a sheet of white paper; and if a shock be sent through it, the paper will be found stained with a blackish tinge at the very juncture of the links. If the charge be very large, the paper, instead of being stained with spots, is brunt through. If the chain be laid upon a pane of glass instead of paper, the glass will often be found stained with spots in several places, but (as might be expected) not so deep as the paper. If this experiment be made in the dark, a spark will be seen at every juncture of the links; and if the links are small, and the shock pretty strong, the chain will appear illuminated like a line of fire.

XXIII. *The Lateral Explosion.*

If a jar be discharged with a discharging rod that has no electric handle, the hand that holds it, in making the discharge, feels some kind of shock, especially when the charge is considerable. In other words: A person, or any conducting substance, that is connected with one side of a jar, but forms no part of the circuit, will feel a kind of shock, *i. e.* some effect of the discharge. This may be rendered visible in the following manner. Connect with the outside of a charged jar a piece of chain; then discharge the jar thro' another circuit, as for instance with a discharging rod in the common way, and the chain that communicates with the outside of the jar, and which makes no part of the circuit, will appear lucid in the dark, *i. e.* sparks will appear between the links; which shows, that the electric fluid, natural to that chain, must by some means have been disturbed. This chain will also appear luminous, if it is not in contact with the outside of the jar, but only very near it; and on making the discharge, a spark will be seen between the jar and the end of the chain near it. This electrical appearance out of the circuit of a discharging jar, is that which we call the *lateral explosion*; and to make it appear in the most conspicuous manner, observe the following method, which is that of Dr Priestley.

When a jar is charged, and stands upon the table as usual, insulate a thick metallic rod, and place it so that one of its ends may be contiguous to the outside coating of the jar; and within about half an inch of its other end place a body of about six or seven feet in length, and a few inches in breadth: then put a chain upon the table, so that one of its ends may be about an inch and a half distant from the coating of the jar: at the other end of the chain apply one knob of the discharging rod, and bring the other knob to the wire of the jar, in order to make the explosion. On making the discharge in this manner, a strong spark will be seen between the insulated rod, which communicates with the coating of the jar and the body near its extremity, which spark does not alter the state of that body in respect to electricity. Whether this lateral explosion is received on flat and smooth surfaces, or upon sharp points, the spark is always equally long and vivid.

XXIV. *To discharge a Jar silently.*

WHEN a large jar is fully charged, which would give
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a terrible shock, put one of your hands in contact with its outside coating; with the other hold a sharp pointed needle, and keeping the point directed towards the knob of the jar, proceed gradually near it, until the point of the needle touches the knob. This operation discharges the jar entirely; and you will either receive no shock at all, or so small a one as can hardly be perceived. The point of the needle, therefore, has silently and gradually drawn all the superfluous fluid from the inside surface of the electric jar.

XXV. *Drawing the Electricity from the Prime Conductor by a Point.*

LET a person hold the knob of a brass rod at such a distance from the prime conductor, that sparks may easily fly from the latter to the former, when the machine is in motion. Then let the winch be turned; and while the sparks are following one another, present the sharp point of a needle at nearly twice the distance from the prime conductor, that the knobbed rod is held; and you will observe that no more sparks will go to the rod:—remove the needle entirely, and the sparks will be seen again;—present the needle, and the sparks disappear: which evidently shows, that the point of the needle draws off silently almost all the fluid that the cylinder throws upon the prime conductor.

If the needle be fixed upon the prime conductor with the point outward, and the knob of a discharging rod, or the knuckle of a finger, be brought very near the prime conductor, though the excitation of the cylinder may be very strong, yet you will perceive that no spark, or an exceeding small one, can be obtained from the prime conductor.

XXVI. *The Electrified Cotton.*

TAKE a small lock of cotton, extended in every direction as much as conveniently can be done; and by a linen thread about five or six inches long, or by a thread drawn out of the same cotton, tie it to the end of the prime conductor: then let the winch of the machine be turned, and the lock of cotton, on being electrified, will immediately swell, by repelling its filaments from one another, and will stretch itself towards the nearest conductor. In this situation let the winch be kept turning, and present the end of your finger, or the knob of a wire, towards the lock of cotton, which will then immediately move towards the finger, and endeavour to touch it; but take with the other hand a pointed needle, and present its point towards the cotton, a little above the end of the finger, and you will observe the cotton immediately to shrink upward, and move towards the prime conductor.—Remove the needle, and the cotton will come again towards the finger. Present the needle, and the cotton will shrink again.

XXVII. *The Electrified Bladder.*

TAKE a large bladder well blown, and cover it with gold, silver, or brass leaf, sticking it with gum-water: suspend this bladder at the end of a silk thread, at least six or seven feet long, hanging from the ceiling of the room; and electrify the bladder, by giving it a strong spark with the knob of a charged bottle: this done, take a knobbed wire, and present it to the bladder when motionless; and you will perceive, that as the knob

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approaches the bladder, the bladder also moves towards the knob, and, when nearly touching it, gives it the spark which it received from the charged phial, and thus it becomes unelectrified. Give it another spark, and, instead of the knobbed wire, present the point of a needle towards it, and you will perceive that the bladder will not be attracted by, but rather recede from, the point, especially if the needle be very suddenly presented towards it.

XXVIII. *The Spider seemingly animated by Electricity.*

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FIG. 51. represents an electric jar, having a wire *CDE* fastened on its outside, which is bended so as to have its knob *E* as high as the knob *A*.—*B* is a spider made of cork, with a few short threads run thro' it to represent its legs. This spider is fastened at the end of a silk thread, proceeding from the ceiling of the room, or from any other support, so that the spider may hang mid-way between the two knobs *A, E*, when the jar is not charged. Let the place of the jar upon the table be marked; then charge the jar, by bringing its knob *A* in contact with the prime conductor, and replace it in its marked place. The spider will now begin to move from knob to knob, and continue this motion for a considerable time, sometimes for several hours.

The inside of the jar being charged positively, the spider is attracted by the knob *A*, which communicates to it a small quantity of electricity; the spider then becoming possessed of the same electricity with the knob *A*, is repelled by it, and runs to the knob *E*, where it discharges its electricity, and is then attracted by the knob *A*, and so on. In this manner the jar is gradually discharged; and when the discharge is nearly completed, the spider finishes its motion.

XXIX. *The Dancing Balls.*

Fix a pointed wire upon the prime conductor, with the point outward; then take a glass tumbler, grasp it with your hands, and present its inside surface to the point of the wire upon the prime conductor while the machine is in motion: the glass in this manner will soon become charged; for its inside surface acquires the electricity from the point, and the hands serve as a coating for the outside. This done, put a few pith balls upon the table, and cover them with this charged glass tumbler. The balls will immediately begin to leap up along the sides of the glass as represented fig. 39. and will continue their motion for a considerable time.

XXX. *The Electrical Jack.*

THIS is an invention of Dr Franklin's, and turns with considerable force, so that it may sometimes be used for the purposes of a common jack. A small upright shaft of wood passes at right angles through a thin round board of about 12 inches diameter, and turns on a sharp point of iron fixed in the lower end, while a strong wire in the upper end, passing through a small hole in a thin brass plate, keeps the shaft truly vertical. About 30 radii, of equal length, made of sash-glass cut into narrow slips, issue horizontally from the circumference of the board, the ends most distant

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from the centre being about four inches apart. On the end of every one a brass thimble is fixed. If now the wire of a bottle electrified in the common way be brought near the circumference of this wheel, it will attract the nearest thimble, and so put the wheel in motion. That thimble, in passing by, receives a spark; and thereby being electrified, is repelled, and so driven forwards; while a second, being attracted, approaches the wire, receives a spark, and is driven after the first; and so on, till the wheel has gone once round; when the thimbles before electrified approaching the wire, instead of being attracted, as they were at first, are repelled, and the motion presently ceases. But if another bottle which had been charged through the coating, or otherwise negatively electrified, is placed near the same wheel, its wire will attract the thimble repelled by the first, and thereby double the force that carries the wheel round. The wheel therefore moves very swiftly, turning round 12 or 15 times in a minute, and with such force, that a large fowl spitted on the upper shaft may be roasted by means of it.

XXXI. *The Self-moving Wheel.*

THIS appears more surprising than the former, though constructed upon the same principles. It is made of a thin round plate of window-glass 17 inches in diameter, well gilt on both sides, all but two inches next the edge. Two small hemispheres of wood are then fixed with cement to the middle of the upper and under sides, centrally opposite; and in each of them a strong thick wire eight or ten inches long, which together make the axis of the wheel. It turns horizontally on a point at the lower end of its axis, which rests on a bit of brass cemented within a glass salt-celler. The upper end of its axis passes through a hole in a thin brass plate, cemented to a long and strong piece of glass; which keeps it fix or eight inches distant from any non-electric, and has a small ball of wax or metal on its top to keep in the fire.

In a circle on the table which supports the wheel, are fixed 12 small pillars of glass, at about 11 inches distance, with a thimble on the top of each. On the edge of the wheel is a small leaden bullet, communicating by a wire with the gilding of the upper surface of the wheel; and about six inches from it is another bullet communicating in like manner with the under surface. When the wheel is to be charged by the upper surface, a communication must be made from the under surface to the table. As soon as it is well charged, it begins to move. The bullet nearest to a pillar moves towards the thimble on that pillar; and, passing by, electrifies it, and is then repelled from it. The succeeding bullet, which communicates with the other surface of the glass, more strongly attracts that thimble on account of its being electrified before by the other bullet; and thus the wheel increases its motion, till the resistance of the air regulates it. It will go half an hour; and make, one minute with another, 20 turns in a minute, which is 600 turns in the whole; the bullet in the upper surface giving in each turn 12 sparks to the thimbles, making in all 2500 sparks; while the same quantity of fire is thought to be received by the under bullet. The whole space moved over by these bullets in the mean time is 2500 feet. If,

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instead of two bullets, you put eight, four communicating with the upper and four with the under surface, the force and swiftness will be greatly increased, and the wheel will make about 50 turns in a minute; but then it will not continue moving for such a long time. These wheels may be applied to the ringing of chimes, and the moving of small erreries, &c.

XXXII. *The Magic Picture.*

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fig. 57.

THIS is a contrivance of Mr Kinnerfley; and is perhaps more calculated to give surprize than any other experiment in electricity. It is made in the following manner: Having a large mezzotint, with a frame and glass (suppose of the king), take out the print, and cut a pannel out of it near two inches distant from the frame all round. If the cut be through the picture, it is nothing the worse. With thin paste, or gum-water, fix the board that is cut off on the inside of the glass, pressing it smooth and close; then fill up the vacancy, by gilding the glass well with leaf-gold or brass. Gild likewise the inner edge of the back of the frame all round, except the top part, and form a communication between that gilding and the gilding behind the glass; then put in the board, and that side is finished. Turn up the glass, and gild the forehead exactly over the back gilding; and when it is dry, cover it, by passing on the pannel of the picture that has been cut out; observing to bring the corresponding parts of the board and picture together, by which the picture will appear of a piece as at first; only part is behind the glass and part before. Lastly, hold the picture horizontally by the top, and place a little moveable gilt crown on the king's head. If now the picture is moderately electrified, and another person take hold of the frame with one hand, so that his fingers touch its inside gilding, and with the other endeavour to take off the crown, he will receive a terrible blow, and fail in the attempt. The operator, who holds the picture by the upper end, where the inside of the frame is not gilt, to prevent its falling, feels nothing of the shock; and may touch the face of the picture without danger, which he pretends to be a test of his loyalty.

XXXIII. *The Thunder-house.*

Fig. 52. is an instrument representing the side of a house, either furnished with a metallic conductor, or not; by which both the bad effects of lightning striking upon a house not properly secured, and the usefulness of metallic conductors, may be clearly represented. *A* is a board about three quarters of an inch thick, and shaped like the gable-end of a house. This board is fixed perpendicularly upon the bottom-board *B*, upon which the perpendicular glass pillar *CD* is also fixed in a hole about eight inches distant from the basis of the board *A*. A square hole *ILMK*, about a quarter of an inch deep, and nearly one inch wide, is made in the board *A*, and is filled with a square piece of wood nearly of the same dimensions. It is mentioned nearly of the same dimensions, because it must go so easily into the hole, that it may drop off by the least shaking of the instrument. A wire *LK* is fastened diagonally to this square piece of wood. Another wire *IH* of the same thickness, having a brass ball *H*, screwed on its pointed extremity, is fastened upon the board *A*; so also is the wire

MN, which is shaped in a ring at *O*. From the upper extremity of the glass pillar *CD*, a crooked wire proceeds, having a spring socket *F*, through which the double knobbed wire slips perpendicularly, the lower knob *G* of which falls just above the knob *H*. The glass pillar *DC* must not be made very fast into the bottom board; but it must be fixed so as it may be pretty easily moved round its own axis; by which means the brass ball *G* may be brought nearer or farther from the ball *H*, without touching the part *EEG*. Now when the square piece of wood *ILMK* (which may represent the shutter of a window or the like) is fixed into the hole so, that the wire *LK* stands in the dotted representation *IM*, then the metallic communication from *H* to *O* is complete, and the instrument represents a house furnished with a proper metallic conductor: but if the square piece of wood *ILMK* is fixed so, that the wire *LK* stands in the direction *LK*, as represented in the figure, then the metallic conductor *HO*, from the top of the house to its bottom, is interrupted at *IM*, in which case the house is not properly secured.

Fix the piece of wood *ILMK* so, that its wire may be as represented in the figure, in which case the metallic conductor *HO* is discontinued. Let the ball *G* be fixed at about half an inch perpendicular distance from the ball *H*; then, by turning the glass pillar *DC*, remove the former ball from the latter; by a wire or chain connect the wire *EF* with the wire *Q* of the jar *P*, and let another wire or chain, fastened to the hook *O*, touch the outside coating of the jar. Connect the wire *Q* with the prime conductor, and charge the jar; then, by tuning the glass pillar *DC*, let the ball *G* come gradually near the ball *H*; and when they are arrived sufficiently near one another, you will observe that the jar explodes, and the piece of wood *ILMK* is pushed out of the hole to a considerable distance from the thunder-house. Now the ball *G*, in this experiment, represents an electrified cloud, which, when it is arrived sufficiently near the top of the house *A*, the electricity strikes it; and as this house is not secured with a proper conductor, the explosion breaks off a part, i. e. knocks off the piece of wood *IM*.

Repeat the experiment with only this variation, viz. that this piece of wood *IM* is situated so, that the wire *LK* may stand in the situation *IM*, in which case the conductor *HO* is not discontinued; and you will observe, that the explosion will have no effect upon the piece of wood *LM*, this remaining in the hole unmoved; which shows the usefulness of the metallic conductor.

Further. Uncrew the brass ball *H* from the wire *HI*, so that this may remain pointed. With this difference only in the apparatus, repeat both the above experiments; and you will find that the piece of wood *IM* is in neither case moved from its place, nor any explosion will be heard; which not only demonstrates the preference of the conductors with pointed termination to those with blunted ones; but also shows that a house furnished with sharp terminations, although not furnished with a regular conductor, is almost sufficiently guarded against the effects of lightning.

This apparatus is sometimes made in the shape of a house, as represented fig. 53. where, for the sake of

Fig. 55.

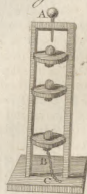


Fig. 54.



Fig. 53.

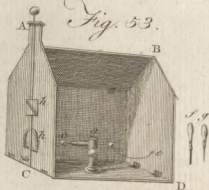


Fig. 52.

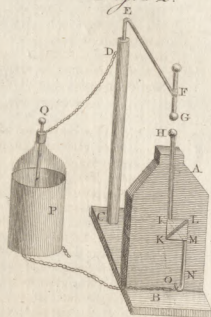


Fig. 59.



Fig. 58.



Fig. 57.



Fig. 56.



Fig. 60.



Fig. 65.

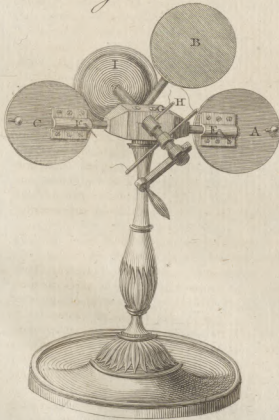


Fig. 62.



Fig. 61.

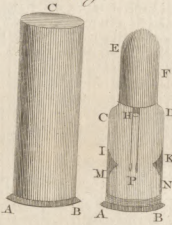


Fig. 64.



Fig. 66.

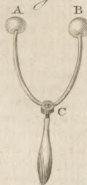
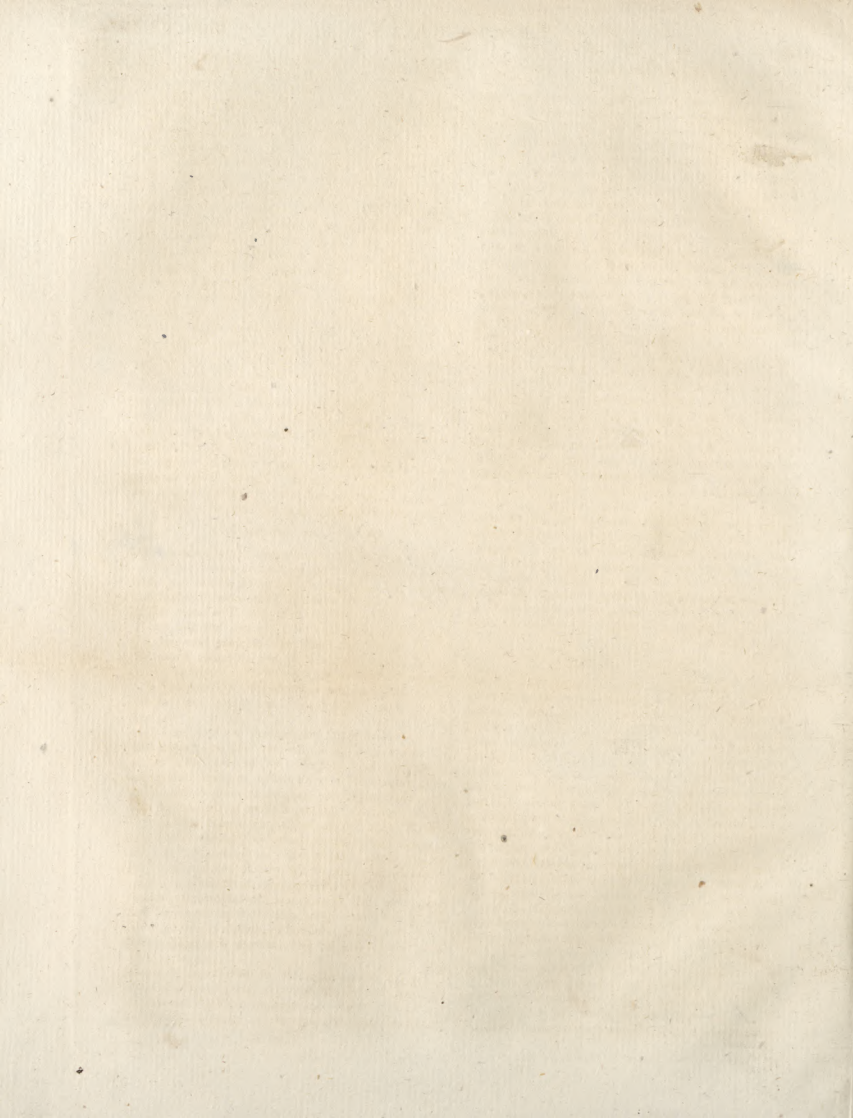


Fig. 63.





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distinctions, the side and part of the roof next the eye are not represented. The gable-end *AC* represents that of the thunder-house, and may be used in the same manner with that above described, or more readily by the following method. Let one ball of the discharging rod touch the ball of the charged jar, and the other the knob *A* of the conductor *AC* of the thunder-house; the jar will then of course explode, and the fluid will act upon the conductor just mentioned. The conducting wire at the windows *bb* must be placed in a line. The sides and gable *AC* of the house, are connected with the bottom by hinges; and the building is kept together by a ridge on the roof. To use this model, fill the small tube *a* with gunpowder, and ram the wire *c* a little way into the tube; then connect the tube *e* with the bottom of a large jar or battery. When the jar is charged, form a communication from the hook at *C*, on the outside, to the top of the jar, by the discharging rod; the discharge will fire the powder, and the explosion of the latter will throw off the roof, with the sides, back, and front, so that they will all fall down together. The figures *f* and *g* in the side of the house represent a small ramrod for the tube *a*, and a prickler for the touch-hole at *C*. Fig. 54. represents a mahogany pyramid, by means of which the same experiment may be exhibited. It is used in a manner similar to that just now described, the piece at *a* being thrown out by the discharge; by which means the upper part falls down in three pieces.

Mr Jones of Holborn makes the front of the common thunder-houses, as well as the powder-house above described, with two pieces of wood or windows *bb*, which, by being placed in proper situations, the one to conduct and the other to resist the fluid, will illustrate by one discharge the usefulness of good conductors for securing buildings or magazines from the explosion of thunder, as well as the danger of using imperfect ones.

XXXIV. The Electric Fly.

THIS fly is composed of small brass wires, fig. 49. fixed into a cap of brass also, easily moveable upon an axis of the same metal, and exactly balanced, so that they may turn with the smallest force. The ends, which ought to be very sharp, are all bent one way, with regard to one another, as those belonging to *a, b*, in the figure; though the two sets of points constituting the two flies there represented, are contrary to each other; so that the whole flies must have a contrary motion. Fixing the axle with the two flies upon the prime conductor, and working the machine, both will begin to turn very swiftly, each in a direction contrary to that of the points. In this manner, with a powerful machine, a great many flies may be made to turn either in the same or in contrary directions; and by their gradual increase or decrease in size may represent a cone or other figure; for the course of each will be marked by a line of fire, and thus the whole will exhibit a beautiful appearance in the dark. The light is said to be more brilliant when the ends are slightly covered with sealing-wax, grease, or other electric matter.

In this experiment the fly will turn the same way whether the electricity be positive or negative; the reason of which will easily be conceived from the theory

already laid down, viz. that in positive electricity the fluid issues from the body electrified, and that in negative electricity it enters into it. In the former case, the recoil of the fluid, which acts equally on the air and on the point from whence it issues, must continually put the point the contrary way; and in negative electricity, when the point solicits a continual draught of electric matter from the air, the direct impulse of the former must also produce a motion in the point in the course in which the fluid itself moves. In vacuo no motion is produced; because there is no air on which the fluid may act when it issues from the point. In like manner, when air is inclosed in a glass vessel, the motion of the electric fly soon stops; because the fluid cannot easily get through the air and the glass, and therefore its motions are impeded so that it cannot press with force sufficient to produce motion. On applying a conductor to the outside of the glass, the fly renews its motion; because an opportunity is now given to the fluid to escape, by running through the glass. But this, for the reasons already given, must soon cease, because a contrary action of the fluid instantly begins to take place; and in a short time becomes equal to that which urges it forward from the machine. The motion of the fly, therefore, stops for the same reason that a Leyden phial becomes at last saturated and cannot receive a greater charge; and which has been already so fully discussed, that it would be superfluous to say more on the subject. Fig. 50. shows another fly which turns perpendicularly, and which will be readily understood from what has been already said.

XXXV. The Electrified Bells.

FIG. 35. represents an instrument having three bells, which are made to ring by electric attraction and repulsion. *B* is a brass rod, furnished with a ring *A* of the same metal, by which it is suspended from another rod fixed in the prime conductor. The outer bells *C* and *E* are suspended by brass chains; but the middle bell *D* and the two small brass clappers between *CD* and *DE* are suspended by silk threads. From the concave under part of the bell *D* a chain proceeds, which falls upon the table, and has a silk thread *E* at its extremity. When this apparatus is hung to the conductor by the ring *A*, and the cylinder of the machine gently turned, the clappers will fly from bell to bell with a rapid motion, and the bells will ring as long as they are kept electrified. The two bells *C* and *E* being suspended by brass chains, are first electrified; hence they attract the clappers, communicate to them a little electricity, and repel them to the unelectrified bell *D*; upon which the clappers deposit their electricity, and move again to the bells *CE*, from which they acquire more, and so on. If, by holding the silk thread *F*, the chain of the middle bell be raised from the table, the bells after ringing a little while will stop; because the bell *D* will have no opportunity of conveying the electricity it receives from the clappers to the ground, being insulated by the silk thread. In the dark, sparks will be seen between the clappers and bells.

Fig. 36. represents a set of bells more elegantly mounted, and which produce a better sound. In these the knob *a* must communicate with the conductor when the apparatus is made use of. Fig. 37. represents

Plate
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a set of eight bells otherwise constructed. The clapper *b* is here suspended by a filken thread from the fly *a b c d*: the axis of the fly rests in a small hole on the top of a glass pillar; and its upper part moves freely in, and is confined by a hole in the brass arm *g*. To make use of these bells they must be applied to the cylinder of the machine, or at least brought very near it when the conductor is removed; so that the fly *a b c d* may be about the height of the centre of the cylinder. The latter being then put in motion, the electricity from it proceeding to the fly, will cause it to turn round in the manner described in the foregoing experiment, and the clapper attracted by each of the bells alternately in its rotation; which, if they are properly turned, will produce a pleasing and harmonious sound.

XXXVI. To fire a Pistol or Cannon by Inflammable Air.

Fig. 40. represents a brass pistol for inflammable air. It consists principally of a chamber, to the mouth *D* of which a cork is fitted: a glass tube *F* is cemented into the top of the chamber, through which a brass wire passes, and is bent within side so as to approach within an eighth part of an inch of the side. On the outside end of this wire is screwed a brass ball *A*, which serves to receive a spark from the conductor of the machine, and conduct it in that form to the inside of the pistol. The inflammable air with which the pistol is to be charged may be made in a common stone-ware or glass bottle, by mixing a handful of iron-filings with about two wine-glassfuls of water and near one of oil of vitriol. The air, when thus made, should be kept in a bottle corked up. To make use of the pistol, take out the cork from the bottle, and instantly apply the mouth of the pistol to the mouth of the bottle; and in about ten seconds it will be sufficiently charged: then remove it, and cork both the pistol and bottle with the utmost expedition: then bring the ball *A* near the prime conductor or the knob of a charged jar; and the spark that passes through the ball, and between the end of the wire within side and the side of the chamber, will fire the inflammable air with a loud report, and drive the cork to a considerable distance. Instruments to fire inflammable air are often made in the form of a cannon with its carriage, as in fig. 41.

XXXVII. The Spiral Tube.

Fig. 42. represents an instrument composed of two glass tubes *C D*, one within another, and closed with two knobbed brass caps *A* and *B*. The innermost of these has a spiral row of small round pieces of tin-foil stuck upon its outside surface, and lying at about one-thirtieth of an inch from each other. If this instrument be held by one of its extremities, and its other extremity be presented to the prime conductor, every spark that it receives from the prime conductor will cause small sparks to appear between all the round pieces of tin-foil stuck upon the innermost tube; which in the dark affords a pleasing spectacle, the instrument appearing accompanied by a spiral line of fire.

Fig. 43. represents several spiral tubes placed round a board, in the middle of which is screwed a glass pillar, and on the top of this pillar is cemented a brass cap with a fine steel point. In this a brass wire turns, having a brass ball at each end, nicely balanced on the wire. To make use of this apparatus, place the middle

of the turning wire under a ball proceeding from the conductor, so that it may receive a succession of sparks from the ball; then push the wire gently round; and the balls in their relative motions will give a spark to each tube, and thereby illuminate them down to the board, which from its brilliancy and rapid motion affords a most beautiful and pleasing sight.

The small pieces of tin-foil are sometimes stuck on a flat piece of glass *ABCD*, fig. 44. so as to represent various fanciful figures. Upon the same principle is the luminous word *light* produced. It is formed by the small separations of the tin-foil pasted on a piece of glass fixed in a frame of baked wood, as represented fig. 45. To use this, the frame must be held in the hand, and the ball *G* presented to the conductor. The spark then will be exhibited in the intervals composing the word; from whence it passes to the hook at *h*, and thence to the ground by a chain. The brilliancy of this is equal to that of the spirals.

XXXVIII. To fire a Piece of Iron-wire in Dephlogificated Air.

The apparatus for this is represented fig. 28. n° 2. where the wire is twisted into a spiral figure. When this is done, it may easily be inserted in the brass knob *D*. The jar comes out of the bottom *C*, and is filled with the dephlogificated air, as directed under the article AEROLGY. The electricity of a common jar being then instantly sent down through the ball and wire at *A*, an explosion takes place betwixt the end of the small wire and the lower ball *B*, which sets the end of the former on fire. It burns with remarkable brightness; and by reason of the spiral shape into which it is twisted, shows the appearance of a small sun moving from the top to the bottom of the jar, and slowly moving round as the wire, which is of a spiral shape, gradually burns away.

XXXIX. The Electrified Capillary Syphon.

Let a small bucket of metal filled with water be suspended from the prime conductor, and put in a glass syphon so narrow in the extremity that the water may just drop from it. If in this disposition of the apparatus the winch of the machine be turned, the water, which when not electrified run out only by drops, will now run in a full stream, or even be subdivided into smaller streams; and if the experiment be made in the dark, the appearance will be very beautiful. The same phenomenon will be exhibited by a small bucket with a jet, as represented fig. 46. or the experiment may be agreeably varied, by hanging one bucket from a positive conductor and another from a negative one; so that the ends of the tubes or jets may be about three or four inches from each other. The stream issuing from the one will be attracted by that issuing from the other, and both will unite into one; but though both are luminous in the dark before meeting, the united stream will not be so unless the one electricity has been stronger than the other.

XL. To illuminate Eggs.

Fig. 55. represents a mahogany stand so constructed as to hold three eggs at a greater or smaller distance, according to the position of the sliding pieces. A chain *C* is placed at the bottom in such a manner as

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to touch the bottom of the egg at *B* with one end, and with its other the outside coating of a charged jar. The sliding wire *A* at top is made to touch the upper egg; and the distance of the eggs afunder should not exceed the quarter or eighth part of an inch. The electricity being by means of the discharging rod sent down the ball and wire at *A*, will in a darkened room render the eggs very luminous and transparent, as has already been mentioned.

XL1. To render Ivory or Boxwood luminous.

PLACE an ivory ball on the prime conductor of the machine, and take a strong spark, or send the charge of a Leyden bottle through its centre, the ball will appear perfectly luminous; but if the charge be not taken through the centre, it will pass over the surface of the ball and corrode it. A spark taken through a ball of boxwood not only illuminates the whole, but makes it appear of a beautiful crimson or rather fine scarlet colour.

XLII. To illuminate Water.

CONNECT one end of a chain with the outside of a charged jar, and let the other lie upon the table. Place the end of another piece of chain at about one quarter of an inch from the former; then set a decanter of water on these separated ends; and on making a discharge, the water will appear perfectly and beautifully luminous.

XLIII. To make a beautiful Appearance in vacuo.

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CLXXXVI.

FIG. 58. represents a glass barometer tube, having on the end *B* a steel cap fastened to the glass with cement. From this proceed a wire and ball *cd*. Fill this tube with quicksilver; and then by sending up a large bubble of air, and repeatedly inverting the tube, free the quicksilver and iron ball from air: then put a small drop of ether on the quicksilver, and put the finger on the end of the glass tube; and then invert the end *f* in a basin of quicksilver, taking care not to remove the finger from the end of the tube till the latter be immersed under the surface of the quicksilver. When the finger is removed, the mercury will descend, and the ether expand itself; present the metallic top of the tube to a large charged conductor, and a beautiful green spark will pass through the vapour of the ether from the ball *d* to the quicksilver. By admitting a small quantity of air into the tube, an appearance something like a falling star is produced.

XLIV. To render Gold-leaf or Dutch-metal luminous.

THIS is done by discharging the contents of a small Leyden jar over it. A strip of gold leaf one-eighth of an inch in breadth and a yard long, will frequently be illuminated throughout its whole extent, by the explosion of a jar containing two gallons. This experiment may be beautifully diversified, by laying the gold or silver leaf on a piece of glass, and then placing the glass in water; for the whole gold-leaf will appear most brilliantly luminous in the water, by exposing it thus circumstanced to the explosion of a battery.

XLV. To perforate a Glass Tube.

FIG. 59. represents a small glass tube flopped at one

end with a piece of cork; *k* is a wire with a ball, at Entertainment one end of which is a brass ball; the other passes thro' ing Experi- a cork fitted to the upper part of the tube. This ments end of the wire is bent at right angles, in such a manner as to approach the side of the tube. To perform the experiment, take out the upper cork and wire, and then pour some fallad oil into the tube; replace the cork, and push down the wire, so that the end of it may be near or rather below the surface of the oil; present the ball to the electrified conductor, holding the finger or any other conducting substance opposite to the bent end of the wire; and when the spark passes from the conductor to the brass ball, the same will pass along the wire, perforating the tube in order to get at the finger, and produce a curious agitation of the oil.

XLVI. The Inflammable Air-lamp.

FIG. 60. represents this machine, which is an invention of M. Volta. *A* is a glass globe to contain the inflammable air; *B*, a glass basin or reservoir to hold water; *D*, a cock to form occasionally a communication between the reservoir of water and that of air. The water passes into the latter through the metal pipe *gg*, which is fixed to the upper part of the reservoir *A*; as *i* is a small cock to cut off or open a communication with the air in the ball and the jet *K*. *N* is a small pipe to hold a piece of wax taper; *L*, a brass pillar, on the top of which is a ball of the same metal; *a* is a pillar of glass with a socket at top, in which the wire *b* slides, having a ball screwed on the end of it. *F* is a cock by which the ball *A* is filled with inflammable air, and which afterwards serves to confine the air, and what water falls from the basin *B* into the ball *A*.

To use this instrument, after having filled the reservoir *A* with pure inflammable air and the basin with water, turn the cocks *D* and *i*, and the water which falls from the basin *B* will force out some of the inflammable air, and cause it to pass through the jet *K* into the air. If an electric spark be made to pass from the brass ball *m* to that marked *n*, the inflammable jet which passes through the pipe *K* will be fired. To extinguish the lamp, first shut the cock *i*, and then the cock *D*. The inflammable air is made of the usual ingredients, viz. iron-sfilings and vitriolic acid; and the reservoir is filled in the following manner: Having previously filled *A* with water, place the foot *R* in a tub of that fluid which may cover it, so that the bent glass tube through which the air passes may pass commodiously below the foot of the lamp. When the air has nearly driven out all the water, turn the cock *F*, and the apparatus is ready for use. This instrument is convenient for preserving a quantity of inflammable air ready for any occasional experiment, as charging the inflammable air-pistol, &c. It is also convenient for lighting a candle for economical purposes, as the least spark from an electrophorus or a small bottle is sufficient to fire the air.

XLVII. Imitations of the Planetary Motions.

See below, *Uses of the Electric Fluid in the System of Nature.*

XLVIII. Beautiful Figures produced in Powdered Rosin, &c. stirred over an Electric Substance. Ibid.

SECT. IX. *Experiments of a Miscellaneous Nature, viz. those relating to the Effects of the Electric Fluid on Colours; on its Velocity; the Changes of Electric into Conducting Substances; the impossibility of forcing the Fluid through a perfect Vacuum; the Power of Batteries; its Direction in various Cases; Improvements in the Method of Excitation, &c.*

THESE experiments, though far from being unentertaining, we have thought proper to class under a different title, as many might wish to amuse themselves with producing an agreeable and beautiful phenomenon who would not choose to make experiments for the sake of investigating unknown subjects, where perhaps little else than the labour of making the experiment might be the reward of the operator. These experiments also may be truly said to be of an anomalous nature; as not being founded upon any known laws of electricity, but rather a collection of facts; from some of which we may afterwards deduce the laws by which this subtle fluid is occasionally governed. We shall begin with experiments made by Mr Cavallo upon substances painted over with colours of different kinds. They were occasioned by his having observed that an electric shock, sent over the surface of a card, made a black stroke upon a red spot, from which he was induced to try the effect of sending shocks over cards painted with different water-colours. The force employed was generally about one foot and an half of charged glass; and the shocks were sent over the cards while the latter were in a very dry state.

Vermilion was marked with a strong black track, about one-tenth of an inch wide. This stroke is generally single, as represented by *AB*, fig. 74. n° 2. of Plate CLXXVII. Sometimes it is divided in two towards the middle, like *EF*; and sometimes, particularly when the wires are set very distant from one another, the stroke is not continued, but interrupted in the middle, like *GH*. It often, although not always, happens, that the impression is marked stronger at the extremity of that wire from which the electric fluid issues, as it appears at *E*, supposing that the wire *C* communicates with the positive side of the jar; whereas the extremity of the stroke, contiguous to the point of the wire *D*, is neither so strongly marked, nor surrounds the wire so much, as the other extremity *E*.

Carmine received a faint and slender impression of a purple colour.

Verdigris was shaken off from the surface of the card; except when it had been mixed with strong gum-water, in which case it received a very faint impression.

White-lead was marked with a long black track, not so broad as that on vermilion.

Red lead was marked with a faint mark much like carmine.

The other colours I tried were orpiment, gamboge, sap-green, red-ink, ultramarine, Prussian blue, and a few others, which were compounds of the above; but they received no impression.

It having been intimated, that the strong black mark, which vermilion receives from the electric shock, might possibly be owing to the great quantity of sulphur contained in that mineral, I was induced to make the following experiment. I mixed together equal quantities of orpiment and flower of sulphur; and with this mixture, by the help, as usual, of very diluted gum-water, I painted a card; but the electric shock sent over it left not the least impression.

Desirous of carrying this investigation on colours a little further, with a particular view to determine something relative to the properties of lamp-black and oil (*c*), I procured some pieces of paper painted on both sides with oil colours; and sending the charge of two feet of coated glass over each of them, by making the interruption of the circuit upon their surfaces, I observed that the pieces of paper painted with lamp-black, Prussian blue, vermilion, and purple brown, were torn by the explosion; but white lead, Naples yellow, English-ochre, and verdigris, remained unhurt.

The same shock sent over a piece of paper painted very thickly with lamp-black and oil left not the least impression. I sent the shock also over a piece of paper unequally painted with purple brown, and the paper was torn where the paint lay very thin, but remained unhurt where the paint was evidently thicker. These experiments I repeated several times and with some little variation, which naturally produced different effects; however, they all seem to point out the following propositions.

I. A coat of oil-paint over any substance, defends it from the effects of such an electric shock as would otherwise injure it; but by no means defends it from any electric shock whatever. II. No one colour seems preferable to the others, if they are equal in substance, and equally well mixed with oil; but a thick coating does certainly afford a better defence than a thinner one.

By rubbing the above mentioned pieces of paper, I find that the paper painted with lamp-black and oil is more easily excited, and acquires a stronger electricity, than the papers painted with the other colours; and, perhaps, on this account it may be, that lamp-black and oil might resist the shock somewhat better than the other paints.

It is remarkable, that vermilion receives the black impression, when painted with linseed oil, nearly as well as when painted with water. The paper painted with white lead and oil receives also a black mark; but its nature is very singular. The track, when first made, is almost as dark as that marked on white-lead painted

(c) "It has often been observed, that when lightning has struck the masts of ships, it has passed over such parts of the masts as were covered with lamp-black and tar, or painted with lamp-black and oil, without the least injury, at the same time that it has shivered the uncoated parts in such a manner as to render the masts useless."

Fig. 68.

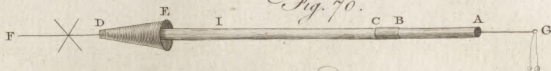


Fig. 70.

Fig. 71.

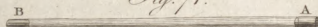


Fig. 72.

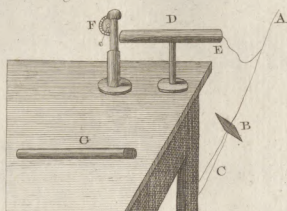


Fig. 74. N.º 2.



Fig. 73.

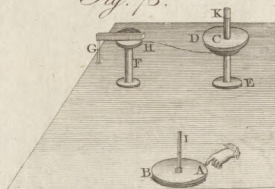
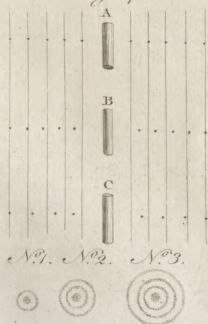


Fig. 75.



N.º 1. N.º 2. N.º 3.

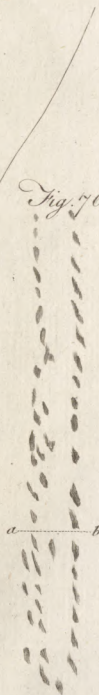
Fig. 78.

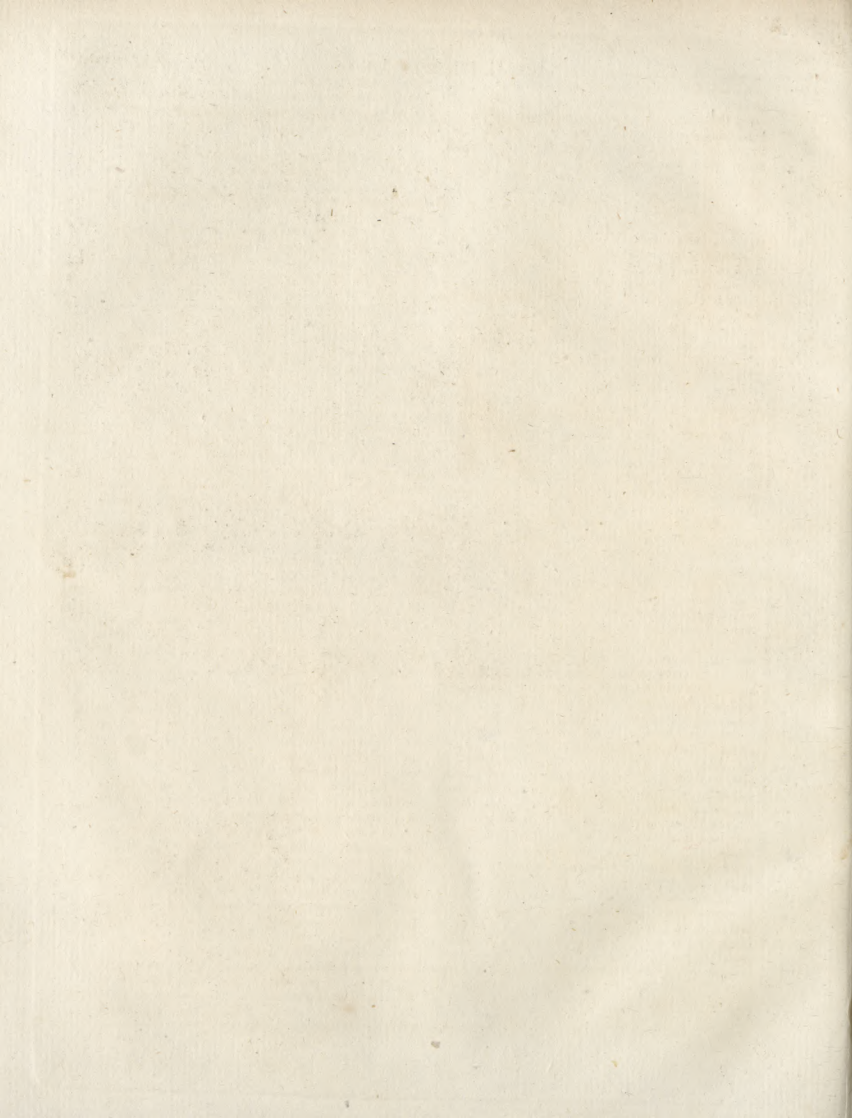


Fig. 77.



Fig. 76.





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123 painted with water; but it gradually loses its blackness, and in about an hour's time (or longer, if the paint is not fresh) it appears without any darknes; and when the painted paper is laid in a proper light, appears only marked with a colourless track, as if made by a finger-nail. I sent the shock also over a piece of board which had been painted with white-lead and oil about four years before, and the explosion marked the black track upon this also: this track, however, was not so strong, nor vanished so soon, as that marked upon the painted paper; but in about two days time it also vanished entirely."

Electric shock calcines, vitrifies, re-vivifies minerals.

Another very remarkable property of the electric fluid is, that it both calcines, vitrifies, and re-vivifies, metals. The calcination of them appears from Dr Priestley's experiments with the brags chain, formerly mentioned, where the black dust was plainly a calc of the metal. The vitrification is performed by exploding small wires of any kind with the shock of a battery. In this case, the small globules of metal, even though gold, silver, or platinum, are found to be completely vitrified. The revivification is an experiment of Mr Beccaria. This he did by making the explosion between two pieces of the calces; and thus he revivified several metallic substances, particularly zinc, and even produced real quicksilver from cinnabar. In this case, he always observed streaks of black beyond the coloured metallic stains; owing, as he supposed, to the phlogiston driven from the parts that were vitrified, when the other part revivified the calc.

124 Mr Beccaria's experiments to show that the electric matter throws light conducting substances before it.

Mr Beccaria also discovered another very remarkable property of the electric matter; namely, that when it is obliged to pass through air, or any other substance through which it makes its way with difficulty, it throws before it all light conducting substances it can find, in order to facilitate its own passage; and thus it will pass through a greater quantity of resisting medium than it would otherwise be able to do. The experiments from which Mr Beccaria drew this conclusion, were the following. He put a narrow piece of leaf-silver between two plates of wax, laying it across them, but so that it did not quite reach one of the sides. The discharge being made through this strip of metal, by bringing a wire opposite to the silver, at the place where it was discontinued; the silver was found melted, and part of it dispersed all along the track that the electric matter took between the plates of wax, from the silver to the wire. Happening once to receive, inadvertently, the charge of a small jar through some smoke of spirit of nitre, a hole was made in his thumb, where the fire entered, and which he thought could only have been made by the acid carried along by the electric fluid. Dr Priestley hath made several more experiments, in order to ascertain this remarkable property; and of which he gives the following account.

125 Dr Priestley's experiments on this subject.

"I discharged frequent shocks, both of a common jar, and another of three square feet, through trains of brags dust, laid on a stool of baked wood, making interruptions in various parts of the train; and always found the brags dust scattered in the intervals, so as to connect the two disjointed ends of the train; but then it was likewise scattered nearly as much from almost all other parts of the train, and in all directions. The scattering from the train itself was probably occasioned by small electric sparks between the particles

of the dust; which, causing a vacuum in the air, Mischellaneous Experiments. drove all that light matter to a considerable distance. But the particles of the dust, which were strowed in the intervals of the train, some of which were at least three inches, could hardly be conveyed in that manner.

"When small trains were laid, the dispersion was the most considerable, and a light was very visible in the dark, illuminating the whole circuit. It made no difference, in any of these experiments, which way the shock was discharged.

"When I laid a considerable quantity of the dust at the ends of two pieces of chain, through which the shock passed, at the distance of about three inches from one another, the dust was always dispersed over the whole interval, but chiefly laterally; so that the greatest quantity of it lay in arches, extending both ways, and leaving very little of it in the middle of the path. It is probable, that the electric power would have spread it equally, but that the vacuum made in the air, by the passage of the fluid from one heap of dust to the other, dispersed it from the middle part.

"I then insulated a jar of three square feet, and upon an adjoining glass-stand laid a heap of brags dust; and at the distance of seven or eight inches a brags rod communicating with the outside of the jar. Upon bringing another rod, communicating with the inside, upon the heap of dust, it was dispersed in a beautiful manner, but not one way more than another. However, it presently reached the rod communicating with the outside.

"Making two heaps, about eight inches asunder, I brought one rod communicating with the inside upon one of them, and another rod communicating with the outside upon the other. Both the heaps were dispersed in all directions, and soon met; presently after which the jar was discharged, by means of this dispersed dust, in one full explosion. When the two heaps were too far asunder to promote a full discharge at once, a gradual discharge was made through the scattered particles of the dust.

"When one heap of dust was laid in the centre of the stand, and the two rods were made to approach on each side of it, they each attracted the dust from the side of the heap next to them, and repelled it again in all directions. When they came very near the heap, the discharge was made through it, without giving it any particular motion.

"All these experiments show, that light bodies possessed of a considerable share of electricity, disperse in all directions, carrying the electric matter to places not abounding with it; and that they sometimes promote a sudden discharge of great quantities of that matter from places where it was lodged, to places where there was a defect of it. But an accident led me to a much more beautiful, and perhaps a more satisfactory, manner of demonstrating the last part of this proposition, than any that I hit upon while I was pursuing my experiments with that design.

"Hanging a drop of water upon the knob of a brags rod communicating with the inside of my battery, in order to observe what variety it might occasion in the circular spots above mentioned, I was greatly surprised to find the explosion made all at once, at the distance of two inches.

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"I afterwards put some brass dust upon a plate of metal communicating with the inside of the battery; and making the discharge through the dust, it exploded at the distance of an inch and a half. The dust rose towards the discharged rod, and from thence was dispersed in all directions.

"These experiments are the more remarkable, as they demonstrate so great a difference between the distance at which the battery may be made to discharge at once, by the help of these light bodies, and without them. When the discharge of a battery by the knobs of brass rods, in the open air, is at the distance of about half an inch; it will, by this means, be made at about two inches."

Experiments concerning the velocity of the electric fluid.

The motions of the electric fluid, though prodigiously quick, are not instantaneous. The shock of the Leyden phial, indeed, hath been transmitted through wires of several miles in length, without taking up any sensible space of time. That is, supposing two persons to hold the ends of the wire, one communicating with the knob, and the other with the outside coating of the phial, both would feel the shock at the same instant; nor would it make any alteration though a considerable part of the surface of the ground was made part of the conductor. Dr Priestley relates several very curious experiments made with a view to ascertain this point soon after the Lyden phial was discovered. These experiments were planned and directed by Dr Watson, who was present at every one of them. His chief assistants were Martin Folkes, Esq; president of the royal society, Lord Charles Cavendish, Dr Bevis, Mr Graham, Dr Birch, Mr Peter Daval, Mr Trembley, Mr Ellicott, Mr Robins, and Mr Short. Many other persons, and some of distinction, gave their attendance occasionally.

Dr Watson, who wrote the history of their proceedings, in order to lay them before the royal society, begins with observing (what was verified in all their experiments), that the electric shock is not, strictly speaking, conducted in the shortest manner possible, unless the bodies through which it passes conduct equally well; for that, if they conduct unequally, the circuit is always formed through the best conductor, though the length of it be ever so great.

The first attempt these gentlemen made, was to convey the electric shock across the river Thames, making use of the water of the river for one part of the chain of communication. This they accomplished on the 14th and 18th of July 1747, by fastening a wire all along Westminster bridge, at a considerable height above the water. One end of this wire communicated with the coating of a charged phial, the other being held by an observer, who, in his other hand, held an iron rod, which he dipped into the river. On the opposite side of the river stood a gentleman, who likewise dipped an iron rod in the river with one hand; and in the other held a wire, the extremity of which might be brought into contact with the wire of the phial.

Upon making the discharge, the shock was felt by the observers on both sides the river, but more sensibly by those who were stationed on the same side with the machine; part of the electric fire having gone from the wire down the moist stones of the bridge, thereby making several shorter circuits to the phial, but still all

passing through the gentlemen who were stationed on the same side with the machine. This was, in a manner, demonstrated by some persons feeling a sensible shock in their arms and feet, who only happened to touch the wire at the time of one of the discharges, when they were standing upon the wet steps which led to the river. In one of the discharges made upon this occasion, spirits were kindled by the fire which had gone through the river.

Upon this, and the subsequent occasions, the gentlemen made use of wires in preference to chains; for this, among other reasons, that the electricity which was conducted by chains was not so strong as that which was conducted by wires. This, as they well observed, was occasioned by the junctures of the links not being sufficiently close, as appeared by the snapping and flashing at every juncture where there was the least separation. These lesser snappings, being numerous in the whole length of a chain, very sensibly lessened the great discharge at the gun-barrel.

Their next attempt was to force the electrical shock to make a circuit of two miles, at the New River at Stoke Newington. This they performed on the 24th of July 1747, at two places; at one of which the distance by land was 800 feet, and by water 2000: in the other, the distance by land was 2800 feet, and by water 8000. The disposition of the apparatus was similar to what they before used at Westminster bridge, and the effect answered their utmost expectations. But as, in both cases, the observers at both extremities of the chain, which terminated in the water, felt the shock as well when they stood with their rods fixed into the earth 20 feet from the water, as when they were put into the river; it occasioned a doubt, whether the electric circuit was formed through the windings of the river, or a much shorter way, by the ground of the meadow: for the experiment plainly showed, that the meadow-ground, with the grass on it, conducted the electricity very well.

By subsequent experiments they were fully convinced, that the electricity had not in this case been conveyed by the water of the river, which was two miles in length, but by land, where the distance was only one mile; in which space, however, the electric matter must necessarily have passed over the New River twice, have gone through several gravel pits, and a large stable field.

July 28th, they repeated the experiment at the same place, with the following variation of circumstances. The iron wire was, in its whole length, supported by dry sticks, and the observers stood upon original electric; the effect of which was, that they felt the shock much more sensibly than when the conducting wire had lain upon the ground, and when the observers had likewise stood upon the ground, as in the former experiment.

Afterwards, every thing else remaining as before, the observers were directed, instead of dipping their rods into the water, to put them into the ground, each 150 feet from the water. They were both sinistral fruck, though they were distant from each other above 500 feet.

The same gentlemen, pleased with the success of their former experiments, undertook another, the object of which was, to determine whether the electric

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virtue could be conveyed through dry ground; and, at the same time, to carry it through water to a greater distance than they had done before. For this purpose they pitched upon Highbury-barn beyond Islington, where they carried it into execution on the 5th of August 1747. They chose a station for their machine almost equally distant from two other stations for observers upon the New River; which were somewhat more than a mile asunder by land and two miles by water. They had found the streets of London, when dry, to conduct very strongly for about 40 yards; and the dry road at Newington about the same distance. The event of this trial answered their expectations. The electric fire made the circuit of the water, when both the wires and the observers were supported upon original electrics, and the rods dipped into the river. They also both felt the shock, when one of the observers was placed in a dry gravelly pit, about 300 yards nearer the machine than the former station, and 100 yards distant from the river: from which the gentlemen were satisfied, that the dry gravelly ground had conducted the electricity as strongly as water.

From the shocks which the observers received in their bodies, when the electric power was conducted upon dry sticks, they were of opinion, that, from the difference of distance simply considered, the force of the shock, as far as they had yet experienced, was very little if at all impaired. When the observers stood upon electrics, and touched the water or the ground with the iron rods, the shock was always felt in their arms or wrists; when they stood upon the ground with their iron rods, they felt the shock in their elbows, wrists, and ankles; and when they stood upon the ground without rods, the shock was always felt in the elbow and wrist of that hand which held the conducting wire, and in both ankles.

The last attempt of this kind which these gentlemen made, and which required all their sagacity and address in the conduct of it, was to try whether the electric shock was perceptible at twice the distance to which they had before carried it, in ground perfectly dry, and where no water was near; and also to distinguish, if possible, the respective velocity of electricity and sound.

For this purpose they fixed upon Shooter's-hill, and made their first experiments on the 14th of August 1747; a time when, as it happened, but one shower of rain had fallen during five preceding weeks. The wire communicating with the iron rod which made the discharge, was 6732 feet in length, and was supported all the way upon baked sticks; as was also the wire which communicated with the coating of the phial, which was 3868 feet long, and the observers were distant from each other two miles. The result of the explosion demonstrated, to the satisfaction of the gentlemen present, that the circuit performed by the electric matter was four miles, viz. two miles of wire and two of dry ground, the space between the extremities of the wires; a distance which, without trial, as they justly observed, was too great to be credited. A gun was discharged at the instant of the explosion, and the observers had stop-watches in their hands, to note the moment when they felt the shock; but, as far as they could distinguish, the time in which the electric matter performed that vast circuit might have been instantaneous.

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In all the explosions where the circuit was made of considerable length, it was observed, that though the phial was very well charged, yet that the snap at the gun-barrel, made by the explosion, was not near so loud as when the circuit was formed in a room; so that a by-stander, says Dr Watfon, though versed in these operations, would not imagine, from seeing the flash, and hearing the report, that the stroke at the extremity of the conducting wire could have been considerable; the contrary whereof, when the wires were properly managed, he says, always happened.

Still the gentlemen, unwearied in these pursuits, were desirous, if possible, to ascertain the absolute velocity of electricity at a certain distance; because, though in the last experiment, the time of its progress was certainly very small, if any, they were desirous of knowing, small as that time might be, whether it was measurable; and Dr Watfon had contrived an excellent method for that purpose.

Accordingly, on the 5th of August 1748, the gentlemen met once more, and the last time, at Shooter's-hill; when it was agreed to make an electric circuit of two miles, by several turnings of the wire in the same field. The middle of this circuit they contrived to be in the same room with the machine, where an observer took in each hand one of the extremities of the wires, each of which was a mile in length. In this excellent disposition of the apparatus, in which the time between the explosion and the shock might have been observed to the greatest exactness, the phial was discharged several times; but the observer always felt himself shocked at the very instant of making the explosion. Upon this the gentlemen were fully satisfied, that through the whole length of this wire, which was 12,276 feet, the velocity of the electric matter was instantaneous.

With all this surprising velocity, however, it is certain, that both sides of a charged phial may be touched so quickly, even by the best conductors, that all the electric matter hath not time to make the circuit, and the phial will remain but half discharged. ¹²⁷ Sometimes the fluid seems to move more slowly.

If the upper plate of an electrophorus also is very suddenly touched with the finger, or any other conductor, a very small spark will be obtained on lifting it up; though a very strong one would be got if the finger was kept longer upon it. But how this seeming slowness can be reconciled with the immeasurable velocity above-mentioned, doth not appear. It is certain, indeed, that this fluid is considerably resisted in its passage through or over every substance. It will even prefer a short passage in the air where it is violently resisted to one along a wire of very great length; but here, as in every other case, it seems to divide its force, and to break out through several different passages at once. A method of ascertaining this hath been contrived by Dr Priestley, thus. Bend a wire, about five feet long, so that one part may come within half an inch of the other; then connect the extremities of the wire with the hook of the battery, and send a shock through it. On making the explosion, a spark will be seen between the two parts which approach nearest to each other; which shows that the fluid chooses a short passage through the air, rather than the long one through the wire. The charge, however, does not pass entirely between these two parts, but some of it goes also thro' the wire. This may be proved by putting a slender wire

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between the two approaching parts: for, on making the discharge with only this addition in the apparatus, the small wire will hardly be made red hot; whereas, if the large wire be cut so as to discontinue the circuit, the small wire will be melted, and even exploded, by the same shock that before made it scarcely red hot. But though we can easily show that the electric fluid always meets with resistance, it is by no means easy to show why the same resistance which puts a temporary stop to its motions in some cases, doth not in all.

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Water becomes electric by cold.

Another curious experiment in electricity is the converting of conducting substances into electrics by cold, and of changing electrics into conductors by heat. The first hath yet been done only in the instance of water. This is a discovery of Mr Achard's at Berlin, who, in the month of January 1776, observed, that water frozen to the 20th degree below the freezing point of Reaumur's thermometer, answering to the 13th below 0 of Fahrenheit's, is an electric. He tried his experiments in the open air, where he found, that a rod of ice two feet long and two inches thick, was a very imperfect conductor when Reaumur's thermometer was at six degrees below 0; and that it would not in the least conduct when the thermometer was sunk to 20°. By whirling a spheroid of ice in a proper machine, he even electrified the prime conductor so as to attract, repel, give sparks, &c. The ice made use of was free from air-bubbles, and quite transparent; to produce which, he used to let a vessel containing distilled water be frozen, upon the window of a room which was rather warm with respect to the ambient air; so that the water began to freeze on the one side of the vessel, while on the other it was still liquid.

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Electrics become conductors by heat.

To prove that glass and other electrics become conductors when very hot: Take a small glass tube of about one-twentieth of an inch in diameter, and above a foot long; close it at one end, and introduce a wire into it, so that it may be extended through its whole length; let two or three inches of this wire project above the open end of the tube, and there fasten it with a bit of cork; tie round the closed end of the tube another wire, which will be separated from the wire within the tube only by the glass interposed between them. In these circumstances, endeavour to send a shock through the two wires, *i. e.* the wire inserted in the glass tube and that tied on its outside, by connecting one of them with the outside, and touching the other with the knob of a charged jar; and you will find that the discharge cannot be made unless the tube be broken; because the circuit is interrupted by the glass at the end of the tube, which is interposed between the two wires. But put that end of the tube to which the wire is tied into the fire, so that it may become just red-hot, then endeavour to discharge the jar again through the wires, and you will find that the explosion will be easily transmitted from wire to wire through the substance of the glass, which, by being made red-hot, is become a conductor.

In order to ascertain the conducting quality of hot resinous substances, oils, &c. bend a glass tube in the form of an arch *CEFD*, fig. 77. Plate CLXXVII; and tie a silk string *GCD* to it, which serves to hold it by

when it is to be set near the fire; fill the middle part of this tube with rosin, sealing-wax, &c. then introduce two wires *AE*, *BF*, through its ends, so that they may touch the rosin, or penetrate a little way in it. This done, let a person hold the tube over a clear fire, so as to melt the rosin within it; at the same time, by connecting one of the wires *A* or *B* with the outside of a charged jar, and touching the other with the knob of the jar, endeavour to make the discharge through the rosin, and you will observe, that while the rosin is cold, no shocks can be transmitted through it; but it becomes a conductor according as it melts; and when totally melted, then the shocks will pass through it very freely.

To show that hot air is a conductor, electrify one of the cork-ball electrometers suspended upon the stand fig. 13. of Plate CLXXIV. or electrify the prime conductor with the quadrant electrometer; then bring a red-hot iron within a sufficient distance of the electrometer or prime conductor, and you will find that they soon lose their electricity, which is certainly conducted by the hot air contiguous to the iron; for if the experiment be repeated with the same iron when cold, *i. e.* by bringing it within the same distance of the electrified electrometer or prime conductor, their electricity will not be conducted away as before. It has been observed, that a battery may be discharged by introducing a red-hot iron between two knobs interposed, and standing at some distance from each other in the circuit: but if, instead of iron, there be introduced a piece of red-hot glass between the knobs (the distance between them remaining as at first), the battery cannot be discharged: whence we may infer, that either hot air is not so good a conductor as has been imagined; or else, that air heated by iron is stronger with respect to its conducting power, than when heated by the red-hot glass.

The impossibility of forcing the electric fluid thro' a perfect vacuum, is a doctrine which militates so directly against the theory laid down in Sect. VI. that we cannot by any means omit a very full consideration of it. As this, however, would lead us here into a theoretical disquisition, we shall not enter into any explanation in this place, but defer what is to be said on that subject to the last section, where the uses of the electric fluid in the system of nature are considered. The experiment on which this supposition is founded, was originally made by Mr Walli; who found that it was possible to cleanse a barometrical tube so perfectly of air, that no electric light would be visible in it upon agitating the mercury, as is the case with the common barometers. It has since been repeated to more advantage by Mr William Morgan, who from his observations has deduced some conclusions concerning the action of the electric fluid very inconsistent with that extensive operation which many philosophers have ascribed to it, and which is ascribed to it in various articles of this work. His experiment is published in the Phil. Trans. for 1785, which we shall here extract.

“The non-conducting power of a perfect vacuum, Mr Morgan is a fact in electricity which has been much controverted among philosophers. The experiments made by Mr Walli, F. R. S. in the double barometer tube clearly demonstrated the impermeability of the electric fluid through a vacuum; nor was it, I think, precipitate

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Non-conducting perfect vacuum.

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to conclude from them the impermeability of the electric fluid itself. But this conclusion has been universally admitted; and the following experiments were made with the view of determining its truth or fallacy. When I first attended to the subject, I was not aware that any other attempts had been made besides those of Mr Wallis; and though I have since found myself to have been in part anticipated in one of my experiments, it may not perhaps be improper to give some account of them, not only as they are an additional testimony in support of this fact, but as they led to the observation of some phenomena which appear to be new and interesting.

Plate CLXXXVIII. Fig. 80.

"A mercurial gage *B*. about 15 inches long, carefully and accurately boiled till every particle of air was expelled from the inside, was coated with tin-foil five inches down from its sealed end *A*, and being inverted into mercury thro' a perforation *D*, in the brass cap *E*, which covered the mouth of the cistern *H*, the whole was cemented together, and the air was exhausted from the inside of the cistern thro' a valve *C* in the brass cap *E* just mentioned; which producing a perfect vacuum in the gage, afforded an instrument peculiarly well adapted for experiments of this kind. Things being thus adjusted, (a small wire *F* having been previously fixed on the inside of the cistern to form a communication between the brass cap *E* and the mercury *G*, into which the gage was inverted), the coated end was applied to the conductor of an electrical machine; and notwithstanding every effort, neither the smallest ray of light, nor the slightest charge, could ever be procured in this exhausted gage. I need not observe, that if the vacuum on its inside had been a conductor of electricity, the latter at least must have taken place; for it is well known, that if a glass tube be exhausted by an air-pump, and coated on the outside, both light and a charge may very readily be procured. If the mercury in the gage be imperfectly boiled, the experiment will not succeed; but the colour of the electric light, which, in air rarefied by an exhauster, is always violet or purple, appears in this case of a beautiful green; and what is very curious, the degree of the air's rarefaction may be nearly determined by this means: for I have known instances, during the course of these experiments, where a small particle of air having found its way into the tube *B*, the electric light became visible, and as usual of a green colour; but the charge being often repeated, the gage has at length cracked at its sealed end, and in consequence the external air, by being admitted into the inside, has gradually produced a change in the electric light from green to blue, from blue to indigo, and so on to violet and purple, till the medium has at last become so dense as no longer to be a conductor of electricity. I think there can be little doubt from the above experiments, of the non-conducting power of a perfect vacuum; and this fact is still more strongly confirmed by the phenomena which appear upon the admission of a very minute particle of air into the inside of the gage. In this case the whole becomes immediately luminous upon the slightest application of electricity, and a charge takes place, which continues to grow more and more powerful in proportion as fresh air is admitted, till the density of the conducting medium arrives at its maximum, which it always does when the colour of the electric light is indigo or violet. Under

these circumstances the charge may be so far increased as frequently to break the glass. In some tubes, which have not been completely boiled, I have observed that they will not conduct the electric fluid when the mercury is fallen very low in them; yet upon letting in air into the cistern, so that the mercury shall rise in the gage, the electric fluid, which was before latent in the inside, shall now become visible; and as the mercury continues to rise, and of consequence the medium is rendered less rare, the light shall grow more and more visible, and the gage shall at last be charged, notwithstanding it has not been near an electrical machine for two or three days. This seems to prove, that there is a limit even in the rarefaction of air, which sets bounds to its conducting power; or, in other words, that the particles of air may be so far separated from each other as no longer to be able to transmit the electric fluid; that if they are brought within a certain distance of each other, their conducting power begins, and continually increases till their approach also arrives at its limit, when the particles again become so near as to resist the passage of the fluid entirely, without employing violence, which is the case in common and condensed air, but more particularly in the latter.

"It is surprising to observe how readily an exhausted tube is charged with electricity. By placing it at 10 or 12 inches from the conductor, the light may be seen pervading its inside, and as strong a charge may sometimes be procured as if it were in contact with the conductor: nor does it signify how narrow the bore of the glass may be; for even a thermometer tube, having the minutest perforation possible, will charge with the utmost facility; and in this experiment the phenomena are peculiarly beautiful.

"Let one end of a thermometer tube be sealed hermetically; let the other end be cemented into a brass cap with a valve, or into a brass cock, so that it may be fitted to the plate of an air-pump. When it is exhausted, let the sealed end be applied to the conductor of an electrical machine, while the other end is either held in the hand or connected to the floor. Upon the slightest excitation the electric fluid will accumulate at the sealed end, and be discharged through the inside in the form of a spark, and this accumulation and discharge may be incessantly repeated till the tube is broken. By this means I have had a spark 42 inches long; and had I been provided with a proper tube, I do not doubt but that I might have had a spark of four times that length. If, instead of the sealed end, a bulb be blown at that extremity of the tube, the electric light will fill the whole of that bulb, and then pass through the tube in the form of a brilliant spark, as in the foregoing experiment; but in this case I have seldom been able to repeat the trials above three or four times before the charge has made a small perforation in the bulb. If, again, a thermometer filled with mercury be inverted into a cistern, and the air exhausted in the manner I have described for making the experiment with the gage, a Torricellian vacuum will be produced; and now the electric light in the bulb, as well as the spark in the tube, will be of a vivid green; but the bulb will not bear a frequent repetition of charges before it is perforated in like manner as when it has been exhausted by an air-pump. It can hardly

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Changes of colour in the electric light by the admission of air.

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Surprising case with which an exhausted tube is charged with electricity.

134
Tube perforated by the electric spark.

135
Why the fluid assumes the form of a spark.

be necessary to observe, that in these cases the electric fluid assumes the appearance of a spark (d), from the narrowness of the passage through which it forces its way. If a tube 40 inches long be fixed into a globe 8 or 9 inches in diameter, and the whole exhausted, the electric fluid, after passing in the form of a brilliant spark throughout the length of the tube, will, when it gets into the inside of the globe, expand itself in all directions, entirely filling it with a violet and purple light, and exhibiting a striking instance of the vast elasticity of the electric fluid.

"I cannot conclude this paper without acknowledging my obligations to the ingenious Mr Brook of Norwich, who by communicating to me his method of boiling mercury, has been the chief cause of my success in these experiments (e). I have lately learned from him, that he has also ascertained the non-conducting power of a perfect vacuum; but what steps he took for that purpose, I know not. Of his accuracy, however, I am so well convinced, that had I never made an experiment myself, I should, upon his testimony alone, have been equally assured of the fact. To most of the preceding experiments Dr Price, Mr Laue, and some others of my friends, have been eye-witnesses; and I believe that they were as thoroughly satisfied as myself with the results of them. I must beg leave to observe to those who wish to repeat them, that the first experiment requires some nicety, and no inconsiderable degree of labour and patience. I have boiled many gages for several hours together without success, and was for some time disposed to believe the contrary of what I am now convinced to be the truth. Indeed, if we reason *a priori*, I think we cannot suppose a perfect vacuum to be a perfect conductor without supposing an absurdity: for if this were the case, either our atmosphere must have long ago been deprived of all its electric fluid, by being every where surrounded by a boundless conductor, or this fluid must pervade every part of infinite space; and consequently there can be no such thing as a perfect

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Great difficulty in making this experiment.

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Electric fluid supposed not to reach beyond the atmosphere of the earth.

vacuum in the universe. If, on the contrary, the truth of the preceding experiments be admitted, it will follow, that the conducting power of our atmosphere increases only to a certain height, beyond which this power begins to diminish, till at last it entirely vanishes; but in what part of the upper regions of the air these limits are placed, I will not presume to determine. It would not perhaps have been difficult to have applied the results of some of these experiments to the explanation of meteors, which are probably owing to an accumulation of electricity. It is not, however, my present design to give loose to my imagination. I am sensible, that by indulging it too freely, much harm is done to real knowledge; and therefore, that one fact in philosophy well ascertained, is more to be valued than whole volumes of speculative hypotheses."

A fact so contrary to the generally received opinion of the conducting powers of a vacuum, could not but excite a general surprise, and attempts to repeat the experiment would no doubt be ardently wished for. Unfortunately, however, the experiment itself, as must evidently appear from the account given of it by Mr Morgan, is of such a precarious nature, as must undoubtedly discourage any ordinary electrician from attempting it; for in the first place, there is no hope of success without a very tedious boiling of mercury in a tube for several hours; and even when this is done, the instrument will not remain in a state of perfection for any length of time. Mr Cavallo, who has greatly improved the air-pump, gives an account of some very curious experiments made with this instrument, in order to ascertain the truth of Mr Morgan's position; which we shall likewise give in his own words, with the conclusions he draws from them.

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Cavallo's experiments with an improved air-pump.

"I. In a glass receiver, of six inches diameter and nine inches in height, having a brass cap, a brass wire of two-tenths of an inch in diameter was fixed to its cap, and proceeding through the middle of the receiver, its lower extremity was five inches distant from the aperture of the receiver, and of course of the plate

of

(d) "By cementing the string of a guitar into one end of a thermometer tube, a spark may be obtained as well as if the tube had been sealed hermetically."

(e) "Mr Brook's method of making mercurial gages is nearly as follows: Let a glass tube *L*, (fig. 81.) sealed hermetically at one end, be bent into a right angle within two or three inches of the other end. At the distance of about an inch or less from the angle, let a bulb *K*, of about $\frac{1}{4}$ th of an inch in diameter, be blown in the curved end, and let the remainder of this part of the tube be drawn out *L*, so as to be sufficiently long to take hold of when the mercury is boiling. The bulb *K* is designed as a receptacle for the mercury, to prevent its boiling over; and the bent figure of the tube is adapted for its inversion into the cistern: for by breaking off the tube at *M* within $\frac{1}{4}$ th or $\frac{1}{2}$ th of an inch of the angle, the open end of the gage may be held perpendicular to the horizon when it is dipped into the mercury in the cistern, without obliging us to bring our finger or any other substance into contact with the mercury in the gage, which never fails to render the instrument imperfect. It is necessary to observe, that if the tube be 14 or 15 inches long, I have never been able to boil it effectually for the experiments mentioned in this paper in less than three or four hours, although Mr Brook seems to prescribe a much shorter time for the purpose; nor will it even then succeed, unless the greatest attention be paid that no bubbles of air lurk behind, which to my own mortification I have frequently found to have been the case: but experience has at length taught me to guard pretty well against this disappointment, particularly by taking care that the tube be completely dry before the mercury is put into it; for if this caution be not observed, the instrument can never be made perfect. There is, however, one evil which I have not yet been able to remedy; and that is, the introduction of air into the gage, owing to the unboiled mercury in the cistern: for when the gage has been a few times exhausted, the mercury which originally filled it becomes mixed with that into which it is inverted, and in consequence the vacuum is rendered less and less perfect, till at last the instrument is entirely spoiled. I have just constructed a gage so as to be able to boil the mercury in the cistern, but have not yet ascertained its success."

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of the air-pump, when the receiver was placed upon it. A fine linen thread was fastened towards the top of the wire, and about four inches of it hanged freely along the brass wire, and almost in contact with it. The extremity of the wire, which passing through the brass cap projected out of the receiver, was furnished with a ball. Thus prepared, the receiver was placed upon the plate of the pump, without any leather, or any thing else besides a little oil on its outside edge, which must be always understood in all the other experiments related in the course of this chapter. Then the exhaustion was commenced, and at intervals some electricity was communicated, either by the approach of the conductor of an electrical machine, or the knob of a charged jar, to the brass ball of the wire, in order to observe the strength of the repulsion of the thread from the wire in different degrees of rarefaction; which degrees were ascertained by the short barometrical gage. Proceeding in this manner, it was observed, that till the rarefaction did not exceed one hundred, to wit, till the air remaining within the receiver was not less than the hundredth part of the original quantity, whenever the electricity was communicated to the brass ball, the thread first adhered to the wire, and then was repelled by it; though this repulsion became smaller and smaller, according as the exhaustion came nearer to the above mentioned degree. The clinging of the thread to the wire first, was because being dry, it required some time before it acquired a sufficient quantity of electricity from the wire, and consequently it was not immediately repelled. When the air within the receiver was exhausted above 100 times, the thread was not first attracted and then repelled as before, but only vibrated a little backwards and forwards, and then remained in the situation in which it stood when electricity was not concerned. By exhausting the receiver still farther, the vibration of the thread when electrified was gradually diminished; so that when the degree of rarefaction was above 500, sparks and the discharge of a jar only made the thread vibrate in a manner just sensible; but this vibration, however small, did never become quite insensible, even when the receiver was exhausted to the utmost power of the pump, which was very near 1000. After this the air was gradually admitted into the receiver, and at various intervals the ball of the brass wire was electrified, in order to observe whether the same phenomena appeared at the different degrees of exhaustion as had done before; and they were found to agree with sufficient exactness.

“ II. The brass wire within the same glass receiver was made very short, and from its extremity a fine linen thread, sixes inches long, was suspended; and upon the plate of the pump a small brass stand with a brass pillar was placed: so that when the receiver was put upon the plate, and over the brass stand, about one inch length of the thread stood parallel to, and at various required distances from, the brass pillar (F). In this disposition of the apparatus, whenever any the least quantity of electricity was communicated to the knob of the brass wire, the thread was immediately attracted

by the brass pillar, and adhered to it some time, because, being dry, it did not immediately part with the acquired electricity. At various degrees of exhaustion, the electricity being communicated to the brass ball of the wire, it was found, that the thread was always attracted by the brass pillar, though from a greater or less distance, according as a greater or less quantity remained within the receiver. Thus when the air was rarefied about 100 times, the thread was attracted from about one inch; when the air was rarefied 200 times, it was attracted from about $\frac{1}{4}$ th of an inch; when the air was rarefied 300 times, it was attracted from about $\frac{1}{5}$ th; and after this it was always attracted from about $\frac{1}{5}$ th, even when the air within the receiver was rarefied about 1000 times. It is remarkable, that when the air in the receiver is rarefied about 300 times, if a jar is discharged thro’ the vacuum, by touching its knob with the ball of the wire on the receiver, the thread is not in consequence of it attracted by the brass pillar: the reason of which seems to be, because that large quantity of electricity opens a way thro’ the vacuum, and passes thro’ every part of it; whereas a small quantity of electricity, even the action of a small electrical machine in the same room, at no very great distance from the apparatus, will cause the thread being attracted by the brass pillar.

III. “ The brass stand, with the pillar, and the thread which proceeded from the wire, being removed from under the receiver, a very sensible electrometer was fastened, instead of the thread, to the extremity of the brass wire. This electrometer consisted of two very fine silver wires, each about one inch long, and having a small cone of cork at its extremity. The sensibility of such an electrometer is really surprising; for even the electricity of a single hair excited, does sensibly affect it; and, as its suspension is almost without any friction or other impediment, it never deceives one by appearing to be electrified when in reality it is not so. With this preparation, the receiver being placed upon the plate of the air-pump, the air was gradually exhausted, and at intervals some electricity was communicated to the ball on the outside of the receiver, either by an excited electric or by a charged jar; and it was found that the corks of the electrometer were always made to diverge by it, even when the air was exhausted as much as possible. Indeed their divergency was smaller and smaller, and lasted a shorter time, according as the air was more exhausted, but it was visible to the last.

“ In this experiment, analogous to what has been observed in the preceding, when the air was exhausted above 300 times, if a jar was discharged through the vacuum, or a strong spark was given to the knob on the top of the receiver, the corks of the electrometer diverged very little indeed, and but for an instant; whereas a small quantity of electricity made them diverge more, and remain much longer in that state.

“ It seems deducible from those experiments, that electric attraction and repulsion take place in every degree of rarefaction, from the lowest to about 1000, but that the power diminishes in proportion as the air

(F) This distance was altered by turning the brass wire which passed through a collar of leather in the brass cap of the receiver.

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air is more and more rarefied; and by following the law, we may perhaps conclude with F. Beccaria, that there is no electric attraction nor repulsion in a perfect vacuum: though this will perhaps be impossible to be verified experimentally; because when in an exhausted receiver no attraction or repulsion is observed between bodies to which electricity is communicated, it will be only suspected, that those bodies are not sufficiently small and light. But if we consult reason, and which alone ought to assist us when decisive experiments are not practicable, it seems likely that electric attraction and repulsion cannot take place in a perfect vacuum, by which I only mean a perfect absence of air; because either this vacuum is a conductor or a non-conductor of electricity. If a conductor, and nearer to perfection as it becomes more free from air, it must be a perfect conductor at the same time that it becomes a perfect vacuum; in which case electric attraction or repulsion cannot take place amongst bodies included in it: for, according to every notion we have of electricity, those motions indicate or are the consequence of the intervening space in some measure obstructing the free passage of the electric fluid. And if the perfect vacuum is a perfect non-conductor, then neither electric attraction nor repulsion can happen in it.

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Electric light always visible in the most perfectly exhausted receiver.

"IV. In my former experiments, having always observed the electric light in the receiver of the air-pump, even when the air was rarefied to the utmost power of that machine, I thought proper to repeat that experiment with receivers of various sizes; and accordingly have used receivers of above two feet in height, and some of as large a diameter as the plate of the pump could admit, which is about 14 inches; but the light in it was always visible, only with different colours in different degrees of exhaustion, and always more diffused, and at the same time less dense, when the air was more rarefied; which seems to render it probable, that when the air is quite removed from any space, the electric light is no longer visible in it, as must have been the case with the experiment of Mr Walth's double barometer; for it is a maxim very well established in electricity, that the electric light is only visible when the electric fluid, in passing from one body to another, meets with some opposition in its way; and according to this proposition, when the air is entirely removed from a given receiver, the electric fluid passing through that receiver cannot show any light, because it meets with no opposition; but this will not account for the receiver ever becoming a non-conductor.

"Having just mentioned, that according as the air is more and more rarefied in a receiver, so the electric light becomes gradually more faint, it will be proper to add, that the electric light is more diffused and less bright in an exhausted receiver than in air: Thus, when the receiver is not exhausted, the discharge of a jar through some part of it will appear like a small globe exceedingly bright; but when the receiver is exhausted, the discharge of the same jar will fill the whole receiver with a very faint light: whereas some persons, by seeing the whole receiver illuminated, are apt to say that the light of electricity is rendered stronger and greater by the exhaustion.

"V. It is mentioned by Mr Nairne, in the 67th vol.

of the Phil. Trans. that having put a piece of leather, just as it comes from the leather-sellers, into the receiver of an air pump, and afterwards having rarefied the air in it 148 times, the electric light appeared very faint in it; whereas, without the leather, and even when the air was much more rarefied, the light of the electric fluid, when made to pass through the receiver, was much more apparent. In consequence of this observation, I suspected that a little substance, moisture in the receiver, or some other effluvia of substances, might perhaps prevent the appearance of the electric light in rarefied air; and with this view I began to put various substances successively into the receiver; and after rarefying the air by working the pump, some electric fluid was made to pass through the receiver.

"When a piece of moist leather was put into the receiver, the air could not be rarefied above 100 times, and the electric light appeared divided into a great many branches; though at the same time another sort of faint light filled up the whole cavity of the receiver.

"When a linen rag, moistened with a mixture of spirit of wine and water, was put into the receiver, the pump could not exhaust above 40 times, and the light of electricity appeared divided into many branches.

"A wine-glass full of olive oil placed under the receiver, prevented very little the exhaustion of the pump, the air being rarefied above 400 times. The electric light appeared exactly as it usually does in the same degree of rarefaction when no oil is under the receiver, viz. a uniform faint light inclining to purple or red.

"Concentrated vitriolic acid placed in a glass under the receiver, produced no particular effect. As for the other mineral acids, they were not tried, because, being volatile, they would have damaged the pump.

"Dry solids, that had a considerable smell, as sulphur, aromatic woods previously made very dry, and some resins, produced no particular effect, any more than some of them prevented a very great degree of exhaustion, owing to some moisture which still adhered to them.

"From these experiments it appears, first, that in the utmost rarefaction that can be effected by the attraction, best air-pump, which amounts to about 1000, both the electric light and the electric attraction, though very weak, are still observable: but, secondly, that the attraction and repulsion of electricity become weaker in proportion as the air is more rarefied, and in the same manner the intensity of the light is gradually diminished. Now by reasoning on this analogy we may conclude, that both the attraction and the light will cease in a perfect absence of air: but this will never account for this perfect vacuum ever becoming a non-conductor of electricity; for since the electric fluid is very elastic, and expands itself with more and more freedom in proportion as the resistance of the air is removed, it seems unnatural that it should be incapable of pervading a perfect vacuum: however, the fact seems to be fully ascertained by Mr Walth and Mr Morgan; and the only thing that remains to be done is to investigate the cause of so remarkable a property."

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Prodigious power of the battery applied to the great machine in Teyler's museum.

With regard to the power of the electric fluid, we have already had occasion to speak in various parts of this treatise, and particularly to mention the machine in Teyler's Museum at Haarlem, as that which was capable of accumulating the greatest quantity of electricity that had ever been done artificially. Some of the effects of this machine, without any battery, have already been described; and those which follow are equally calculated to give an idea of its vast power. A battery of 135 vials, containing among them about 130 square feet of coated surface, was charged by about 100 turns of the glass plates; the discharge of which melted an iron wire 15 feet long and $\frac{1}{17}$ of an inch diameter; and another time they melted a wire of the same metal 25 feet long and $\frac{1}{23}$ of an inch in diameter. With such an extraordinary power they tried to give polarity to needles made out of watch-springs of three and even six inches in length, and likewise to steel bars nine inches long, from a quarter to half an inch in breadth, and about the twelfth-part of an inch in thickness. The result was, that when the bar or needle was placed horizontally in the magnetic meridian, whichever way the shock entered, the end of the bar that stood towards the north acquired the north polarity, or the power of turning towards the north when freely suspended, and the opposite end acquired the south. If the bar, before it received the shock, had some polarity, and was placed with its poles contrary to the usual direction, then its natural polarity was always diminished, and often reversed; so that the extremity of it, which in receiving the shock looked towards the north, became the north pole, &c.

When the bar or needle was struck standing perpendicularly, its lowest end became the north pole in any case, even when the bar had some magnetism before, and was placed with the south pole downwards. All other circumstances being alike, the bars seemed to acquire an equal degree of magnetic power, whether they were struck whilst standing horizontally in the magnetic meridian, or perpendicular to the horizon.

When a bar or needle was placed in the magnetic equator, whichever way the shock entered, it never gave it any magnetism; but if the shock was given through its width, then the needle acquired a considerable degree of magnetism, and the end of it which lay towards the west became the north pole, and the other end the south pole.

If a needle or bar, already magnetic, or a real magnet, was struck in any direction, its power was always diminished. For this experiment, they tried considerably large bars; one being 7.08 inches long, 0.26 broad, and 0.05 thick.

When the shock was so strong, in proportion to the size of the needle, as to render it hot, then the needle generally acquired no magnetism at all, or very little.

The experiments lastly tried with this very powerful battery were concerning the calcination of metallic substances, and the revivification of their calces. It appears that the electric shock produced both these apparently contradictory effects.

The metallic calces used in those experiments were of the purest sort; they were confined between glasses whilst the shock was passed over them. By this means the calces were so far revived as to exhibit several

grains of the metal, large enough to be discerned by the naked eye, and to be easily separated from the rest.

As to the calcination of metals, whenever a shock was employed much greater than that which was necessary to fuse the metal, part of the metal was calcined, and dispersed into smoke. It is remarkable, that this calcination or smoke generally produced several filaments, of various lengths and thicknesses, which swam in the air. It was farther observed, that those flying filaments of metallic calx, if a conductor was presented to them, were soon attracted by it; but after the first contact, they were instantly repelled, and generally broke into diverse parts.

Even this vast power was not the utmost effect of the machine. Dr Van Marum, whom we have already mentioned as principally concerned in making the experiments, thinking that it was capable of charging a larger surface, added to it 90 jars, each of the same size with the former; so that his grand battery is now a square of 15 jars every way, and contains 225 square feet of coated glass. To ascertain the degree of the charge, he uses the electrometer invented by Mr Brook, to be afterwards described, which is fixed in the centre of the battery, at the height of four feet above the knobs of the jars.

His first object was to try whether this battery could be fully charged by the machine, and whether its increase of power was proportional to the augmentation of its surface. In these respects, his expectations were fully answered. The former battery discharged itself over the uncoated part of the jars after 96 revolutions; and the present did the same after 160 turns of the machine. With the former battery, the Doctor had split a cylinder of box three inches in diameter and three inches in length, the section of which, through its axis, contained nine square inches. With the 225 jars, he split a similar cylinder, four inches in diameter and four inches in height, the section of which was 16 square inches. He found that to split a square inch of this wood in the same direction, required a force equal to 615 pounds; and hence calculates that the power of this explosion was not less than 9840 pounds.

The apparent resemblance between the effects of electricity and of fire, especially in melting metals, has led many to suppose that they act upon bodies in a similar manner. In order to examine whether this supposition be just, Dr Van Marum caused wires of different metals to be drawn through the same hole, one thirty-eighth part of an inch in diameter, and observed how many inches of each could be melted by the explosion of his battery; taking care, in all these experiments, to charge it to the same degree as ascertained by his electrometer. The results were as follow:

Of lead he melted	-	120 inches.
Of tin	-	120
Of iron	-	5
Of gold	-	$\frac{3}{4}$
Of silver, copper, and brass, not quite a quarter of an inch.		

These several lengths of wire, of the same diameter, melted by equal explosions, indicate, according to our author, the degree in which each metal is fusible by these

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The battery augmented.

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Calculation of the force of its explosion.

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The wires of different kinds melted by it.

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the electrical discharge; and if these be compared with the fusibility of the same metals by fire, a very considerable difference will be observed. According to the experiments of the academicians of Dijon, to melt tin required a heat of 172 degrees of Reaumur's thermometer.

Lead	-	-	-	230
Silver	-	-	-	430
Gold	-	-	-	563
Copper	-	-	-	630
Iron	-	-	-	696

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Electrical fluid supposed to act in a different manner from fire.

Thus tin and lead appear to be equally fusible by electricity, but not by fire: and iron, which by fire is less fusible than gold, is much more so by the electrical explosion. From these and some other experiments of the same kind, Dr Van Marum concludes, that, in melting metals, the electrical fluid acts upon them in a manner very different from the action of fire, and that the supposed analogy between these two powerful agents cannot be proved, either from the fusion of metals, or the ignition of combustible substances.

148
Comparative efficacy of the different metals as conductors

By these experiments on the fusibility of metals, Dr Van Marum was induced to make trial of the comparative efficacy of lead, iron, brass, and copper, as conductors to preserve buildings from lightning. In this respect, he found that a leaden conductor ought to be four times the size of one of iron, in order to be equal in point of safety. He has also fully proved the superiority of rods to chains, and of copper to iron, for this important use.

When iron wire is melted by the explosion of the battery, the red-hot globules are thrown to a very considerable distance, sometimes to that of 30 feet: this the Doctor justly ascribes to the lateral force exerted by the electrical fluid. It is, however, remarkable, that the thicker the wire is which is melted, the further are the globules dispersed: but this is accounted for, by observing, that the globules, formed by the fusion of thinner wires, being smaller, are less able to overcome the resistance of the air, and are therefore sooner stopped in their motion.

Two pieces of iron wire being tied together, the fusion extended no further than from the end connected with the inside coating of the jars to the knot; tho' wire of the same length and thickness, when in one continued piece, had been entirely melted by an equal explosion.

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Wires shortened by the electrical discharge.

When a wire was too long to be melted by the discharge of the battery, it was sometimes broken into several pieces, the extremities of which bore evident marks of fusion; and the effect of electricity in shortening wire was very sensible in an experiment made with 18 inches of iron wire $\frac{1}{2}$ th of an inch in diameter, which, by one discharge, lost a quarter of an inch of its length. An explosion of this battery through very small wires, of nearly the greatest length that could be melted by it, did not entirely discharge the jars. On transmitting the charge through 50 feet of iron wire of $\frac{1}{20}$ th of an inch diameter, the Doctor found that the residuum was sufficient to melt two feet of the same wire; but this residuum was much less when the wire was of too great a length to be melted by the first discharge. After an explosion of the battery through 180 feet of iron wire, of equal

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Very small wires, or not discharge the battery entirely.

diameter with the former, the residuum was discharged through 12 inches of the same wire, which it did not melt, but only blued.

Twenty-four inches of leaden wire $\frac{1}{4}$ th of an inch in diameter, were entirely calcined by an explosion of this battery; the greater part of the lead rose in a thick smoke, the remainder was struck down upon a paper laid beneath it, where it formed a stain, which resembled the painting of a very dark cloud. When shorter wires were calcined, the colours were more varied. A plate is given of the stain made by the calcination of eight inches of this wire, in which the cloud appears variously shaded with different tints of green, gray, and brown, in a manner of which no description can give an adequate idea.

On discharging the battery through eight inches of tin wire $\frac{1}{4}$ th of an inch diameter, extended over a sheet of paper, a thick cloud of blue smoke arose, in which many calcareous filaments were discernible; at the same time a great number of red hot globules of tin, falling upon the paper, were repeatedly thrown up again into the air, and continued thus to rebound from its surface for several seconds. The paper was marked with a yellowish clouded stain immediately under the wire, and with streaks or rays of the same colour issuing from it in every direction: some of these formed an uninterrupted line, others were made up of separate spots. In order to be certain that the colour of these streaks was not caused by the paper being scorched, the experiment was several times repeated, when a plate of glass and a board covered with tin were placed to receive the globules. These, however, were stained exactly like the paper. On calcining five inches of the same kind of wire, the red-hot globules were thrown obliquely to the height of four feet, which afforded an opportunity of observing that each globule, in its course, diffused a matter like smoke, which continued to appear for a little while in the parabolic line described by its flight, forming a track in the air of about half an inch in breadth.

From this phenomenon, Dr Van Marum conjectured, that when the globules approach the paper on which they fall, the matter issuing from their lower part strikes against its surface, and being elastic, forces them upwards again by its reaction. The clouded stain immediately under the wire, the Doctor attributes to the instantaneous calcination of its surface; whereas the remainder of the metal is melted into globules, which, while they retain their glowing heat, continue to be superficially calcined, and, during the process, part with this calcareous vapour.

Phenomena something similar to the above were observed on the calcination of a wire of equal parts of tin and lead, eight inches long, and $\frac{1}{2}$ d of an inch in diameter. This also was melted into red globules, which were repeatedly driven upwards again from the paper on which they fell, and marked it with streaks of the same kind, but of a brown colour, edged with a yellow tinge. Some of these globules, though apparently not less hot, moved with less velocity than others, and were soon stopped in their course by their burning a hole in the paper. In this case, a yellow matter was seen to rise from their surface to the height of one or two lines, which extended itself to the width of a quarter of an inch. This matter continued, during

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Conjectured.

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With wire composed of equal parts of tin and lead.

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five or six seconds, to issue from the globules, and formed, on their surface, a kind of efflorescence, resembling the flowers of sulphur produced by the *solfaterra*. The globules, from which these calcareous flowers had issued, were found to be entirely hollow, and to consist of only a thin shell. When this mixed metal is calcined with a less charge of the battery, it leaves a stain upon the paper, something similar to that made by lead, and does not run into globules.

Stain upon paper by the calcination of metals.

The Doctor has also given plates of the stains made upon paper, by the calcination of iron, copper, brass, silver, and gold. Those made by copper and brass wires are remarkably beautiful, and are variegated with yellow, green, and a very bright brown. Eight inches of gold-wire, $\frac{1}{16}$ th of an inch in diameter, were, by the explosion, reduced to a purple substance, of which a part rose like a thick smoke, and the remainder, falling on the paper, left a stain diversified with different shades of this colour. Gold, silver, and copper, cannot easily be melted into globules. Our author has once accidentally succeeded in this; but it required a degree of electrical force so very particular, that the medium between a charge, which only broke the wire into pieces, and one which entirely calcined it, could not be ascertained by the electrometer.

Effects upon metals confined in phlogisticated air.

Though Dr Van Marum was convinced, by M. Lavoisier's experiments, that metals, calcined in atmospheric air, absorb from it that principle which renders it fit for respiration; yet he resolved further to investigate this point, by trying what would be the effect of a discharge of the battery through a piece of wire confined in phlogisticated air. For this purpose, he took air, in which a burning coal had been extinguished, and which had afterwards floated eight days upon water, that it might be entirely cleared from fixed air; with this he filled a glass cylinder, four inches in diameter, and six inches high, closed at the upper end with a brass-plate; from the centre of this plate the wire was suspended, on which the experiment was made. The cylinder was set in a pewter dish filled with water; and, to prevent its being broken by the expansion of the air, its lower edges were supported by two pieces of wood half an inch high. The lower end of the wire rested on the dish, which was connected with the outside coating of the battery.

In dephlogisticated air.

On transmitting the charge, in this manner, through wires of lead, tin, and iron, of only half the length of those which were calcined by an equal explosion in atmospheric air, no calcination took place. The first was reduced to a fine powder, which, upon trial by spirit of nitre, appeared to be merely lead; the two other metals were melted into small globules.

The Doctor then tried the same experiment in pure or dephlogisticated air, obtained from red precipitate; thinking that, in this, the metals would be more highly calcined than in common air. His expectation was answered only by the lead, which was entirely reduced to a yellow calx, perfectly resembling massicot. The other metals were not more highly calcined in this than in common air; but the globules of iron acquired so great a heat, as to retain it for some seconds, even in the water, and to melt holes in the pewter dish into which they fell.

In nitrous air, calcination took place as easily as in

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common or in dephlogisticated air. This was contrary to Dr Van Marum's expectation; but he accounts for it, by observing that, from the experiments of Mr. Cavendish and of M. Lavoisier, pure air appears to be one of the component parts of the nitrous acid.

In order to illustrate M. Lavoisier's theory, Dr Van Marum resolved to examine the phenomena resulting from the calcination of metals in water. This he tried with both iron and lead; and found that, in the moment of the explosion, a number of air-bubbles appeared on the surface, and the calx rose, like a cloud, through the water. This, he thinks, is not so easily accounted for by the theory of Stahl as by that of M. Lavoisier; because, according to the former, water does not readily either receive or part with phlogiston; whereas the latter supposes this fluid to be composed of the oxygenen principle, united with that of inflammable air. If this be true, nothing more is necessary to calcination, than that the metal should acquire a greater affinity with the oxygenen principle, that subsists between this and that of inflammable air, united with it in the composition of water. To collect the air generated by these calcinations was no easy matter; as the violence of the shock broke the glass receivers employed for this purpose; at last, however, the Doctor contrived a method of receiving it in a glazed stone basin. From the first calcination of lead, about a quarter of a cubic inch of air was produced, which showed no signs of inflammability; but, on every repetition of the experiment, a less quantity of air was generated; and on an accurate trial of that produced by the fourth calcination in the same water, it was found to consist of one part of inflammable and three of atmospheric air. Our author designs to repeat these experiments with water deprived of its air, by being boiled.

In order to imitate the phenomena of earthquakes, this ingenious philosopher followed Dr Priestley's method, and made the electrical explosion pass over a board, floating on water, on which several columns of wood were erected; but this succeeded only once. Reflecting that the electric explosion exerts the greatest lateral force when it passes through imperfect conductors, and that water is probably its principal subterraneous conductor, he laid two smooth boards upon each other, moistening the sides in contact with water; upon the uppermost, he placed pieces of wood, in imitation of buildings, the bases of which were 3 inches long and $1\frac{1}{2}$ broad. When the charge of the battery was transmitted between the boards, all these were thrown down by the tremulous and undulatory motion of that on which they stood.

Mr Brookes, electrician at Norwich, has made a great number of experiments, with a view to determine exactly the force of batteries of an inferior size in melting fine wires of different kinds. In these he was particularly careful to ascertain the degree to which his batteries were charged; and this he did by the method which shall afterwards be shown to be the best, viz. that of determining the power of the electricity by the weight which it was capable of raising by its repulsive power; and therefore, in the following experiments, the phrase of batteries being charged to so many grains, implies that the repulsive power of the knob of the battery was able to raise that weight.

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157 Phenomena from the calcination of metals in water.

158 Phenomena of earthquakes imitated.

159 Brookes's experiments on the force of batteries.

Some of the most remarkable of these experiments were as follow :

" 1. With a battery of nine bottles, containing about 16 square feet of coated surface, charged to 32 grains of repulsion, which charge was sent through a piece of steel wire 12 inches long and $\frac{1}{70}$ th of an inch thick 11 times; the wire was shortened one inch and a half, being then about 10 inches and an half long; the 12th time, the wire was melted to pieces.

" 2. A charge, with the same nine bottles, to 32 grains of repulsion, being sent through a piece of steel wire 12 inches long and $\frac{1}{70}$ th of an inch thick, the first time melted the whole of it into small globules.

" 3. A charge of the same nine bottles charged to 32 grains, being sent through a piece of brass wire 12 inches long, $\frac{1}{70}$ th of an inch thick, the whole of it was melted, with much smoke, almost like gunpowder; but the metallic part of it, after it was melted, formed itself, in cooling, chiefly into concave hemispherical figures of various sizes.

" 4. With only eight of the above bottles charged to 32 grains, the charge did but just melt 12 inches of the steel wire, $\frac{1}{70}$ th of an inch thick, so as to fall into several pieces; which pieces in cooling formed themselves into oblong lumps joining to each other by a very small part of the wire between each lump, which was not melted enough to separate, but appeared like oblong beads on a thread at different distances.

" 5. The same eight bottles charged to 32 grains, so perfectly heated 12 inches of brass wire, about $\frac{1}{70}$ th of an inch thick, as to melt it, or often it enough for it to fall down by its own weight (from the forceps with which it was held at each end) upon a sheet of paper placed under to catch it; and when it fell down, it was so perfectly flexible, that by falling, it formed itself into a bent, or rather vermicular shape, and remained entire its whole length, i. e. about 12 inches when it was put into the forceps; but after it was fallen on the paper, it sagged so much as to be stretched by its own weight from 12 to about 15 inches long; and by falling on the paper it flattened itself the whole length of it, so that when it was examined with an half inch magnifier, it appeared about five or six times broader than it was in thickness.

" 6. With nine bottles again, charged only to 20 grains, the charge was sent through 12 inches of steel wire $\frac{1}{70}$ th of an inch thick, which heated it enough to melt it so as to be separated in many places; and the pieces formed themselves into string-bead-like shapes, as in experiment 4.

" 7. With the same nine bottles charged to 20 grains, the charge was sent through 10 inches of brass wire $\frac{1}{70}$ th of an inch thick; the wire was heated so red hot as to be very flexible, yet it did not separate, but was shortened near $\frac{1}{4}$ ths of an inch.

" 8. A charge of nine bottles, charged to 20 grains, sent a second time through the last piece of wire, melted it asunder in three places.

" 9. Nine bottles charged to 30 grains, and the charge sent through 12 inches of brass wire $\frac{1}{70}$ th of an inch thick, treated it nearly as in experiment 3, except that it was separated in two places, and

the pieces measured about 16 inches and an half long; but perfectly flattened by its fall on the paper, as before.

" 10. Nine bottles charged to 30 grains, and the charge being sent through eight inches and a half of brass wire the size of the last, wholly dispersed it in smoke, and left nothing remaining to fall on the sheet of paper placed under it.

" 11. With 12 bottles, charged to 20 grains, the charge was sent through ten inches of steel wire one hundredth of an inch thick, which made the wire red hot, but did not melt it.

" 12. A second charge, the same as the last, was sent through the same piece of wire, which heated it red hot as the first did, but it was not separated; this piece of wire was now shortened five-sixteenths of an inch.

" 13. A charge to 25 grains, with the same 12 bottles, was sent through the last piece of wire, which melted it into many pieces, and many globules of calcined metal.

" 14. A charge of 15 bottles, charged to 25 grains, was sent through ten inches of steel wire one hundredth of an inch thick, which melted it the first time, and dispersed a great part of it about the room.

" 15. A charge with the last 15 bottles, charged to 20 grains, just melted ten inches of steel wire the size of the former, so as to run into beautiful globules, nearly as in exp. 13.

" 16. A charge of 15 bottles, charged to 15 grains, being sent through ten inches of steel wire the size of the last, it was barely made red hot; but it was shortened one-tenth of an inch by the stroke passing through it.

" 17. The last piece of wire having a charge of 15 bottles, charged to twelve and a half grains, sent thro' it, was not made red hot.

" 18. A charge of the same 15 bottles, charged to 25 grains, was sent through the same piece of wire, which seemingly tore the wire into splinters.

" 19. Four bottles, charged to 30 grains, just melted three inches of steel wire one hundred and seventieth of an inch thick, so as to fall into pieces.

" 20. Five bottles, charged to 25 grains, most beautifully melted three inches of such wire as the last into large globules.

" 21. Eight bottles, charged to 15 grains, melted three inches of steel wire one hundred and seventieth of an inch thick, similar to the five in the last experiment; so nearly alike both in appearance and effect, that it might have been said to be the same.

" 22. Ten bottles charged to twelve and a half grains, rather exceeded exp. 19. but scarcely came up to exp. 20. and 21.

" 23. Suspecting something in exp. 19. I found, that though my bottles hitherto were as nearly of the same size as I could procure them, yet some of them were a little larger than others, and, which was the case in exp. 19. one of the four was smaller than the other three; so that I repeated the experiment with four bottles more equal in size, and charged them to 30 grains, and the fusion was as perfect as in any.

" 24. A charge to 20 grains, with the last eight bottles, very finely melted six inches of steel wire one hundred and seventieth of an inch thick.

"25. With two bottles, charged to 45 grains, the charge was sent through one inch of such sized steel wire as the last, which only changed its colour.

"26. Three bottles, with a 40 grains charge, discharged one inch and a half of steel wire, the size of the last, all about the room.

"27. As a steel wire of one-hundredth of an inch thick has nearly double the quantity of metal of a wire one hundred and seventieth of an inch thick, so I took three inches of the former, and sent a 25 grains charge with ten bottles through it, which melted it just as the five bottles did in exp. 20.

"28. Twenty bottles, charged to twelve grains and a half, melted three inches of steel wire, the size of the last, exactly similar to the foregoing experiment.

"29. As a steel wire of one-eighth of an inch thick contains nearly twice the quantity of metal in the same length as a steel wire of one-hundredth, or four times the quantity of a steel wire of one hundred and seventieth of an inch thick; so it might, from the foregoing experiments, be expected that 20 bottles, charged to 25 grains, would melt three inches of steel wire one-eighth of an inch thick; but on a great many trials 20 bottles could not be procured that would bear the discharge, when charged to 25 grains: for at the discharge there would be always one or more bottles broken or perforated. I was now reduced to the necessity of being content with getting bottles of any size that would bear the required charge, from one to three gallons each, or that contained from about 150 to 300, or more, square inches of coated surface, each; but all in vain, my only resource left (as I was not near any glass house), was to increase the quantity of surface, and not to charge so high, and to proportion the one to the other: a third part was concluded on to be tried; that is, instead of about 36 feet of coating, I added one third, or 12 feet, which made it 48 feet: and that, instead of charging to 25 grains, or 24 grains, which divides by 3 better, to omit one-third of the height of the charge, which leaves 16 grains: and thus I succeeded perfectly well; for 3 inches of steel wire one-eighth of an inch thick was as curiously melted with 48 feet of coated surface, charged to 16 grains, as any of the former.

"These bottles, thus broken in large discharges, seem always to break, or to be struck through, nearly in the thinnest, but never in the thickest place, which shows the necessity of the substance in the glass.

30. "As in exp. 19, and 21, where the former is but half the quantity of coated surface of the latter, charged to 30, and the latter to 15 grains, to know how high 48 feet of coating must be charged to produce the same effect exactly: and as the quantity of coating in four bottles, consisting of a little more than six feet and a half, is contained in 48 feet a little more than seven times; so I tried by charging 48 feet only to a little more than four grains, or only about one seventh part so high, as four times seven is 28; that is, but two less than 30: and this had exactly the same effect on the wire, which was one hundred and seventieth of an inch thick, and three inches long, as the former.

31. "As the last experiment agreed so exactly with exp. 19, and 20, the next thing tried was to see the ef-

fect of 48 feet of coated surface charged to a little more than four grains, upon six inches of steel wire, the size of the last; but this was only made very faintly red.

32. "A repetition of the last experiment with the same length of the same wire, to see how often the same charge might be sent through before it would be melted, and to observe the appearance of the wire after each stroke; the eighth stroke melted it into several pieces. After the first stroke, the redness grew less every time, even the last time, when it was separated. The first stroke, though little more than fairly red, made it so flexible, that by a little more than its own weight (about a penny-weight more), it was apparently made perfectly straight when it was cooled: about the third or fourth stroke it began to appear zig-zagged; after the sixth stroke the surface of it appeared rough; after the seventh stroke the surface was very roughly scorified or scaly; and some of the scales had fallen upon a piece of white paper, placed under it, at about half an inch distance below it. The eighth stroke melted it in three places; and at those places where the angles appeared the sharpest or most acute, a great number of the scaly appearances were driven off about the paper, which appeared like splinters (see exp. 18.); some of them were almost one-tenth of an inch long, and some of them about a third or a fourth part of the diameter of the wire in breadth, and very thin: after the seventh stroke it was shortened seven-sixteenths of an inch: the wire was one hundred and seventieth of an inch thick.

"33. Repeating exp. 31, again with the same size and length of wire, and the same battery charged the same, in order to observe the method of the wire shortening, having fixed an insulated gage parallel to and about a quarter of an inch distant from it: after the first stroke, which made the wire fairly red, (it being fixed at one end, that the shortening might appear all at the other, which was held so as either to contract or dilate), I observed that it shortened considerably as it cooled; repeating the stroke, it did the same, and so on till it was melted, which was by the eighth stroke, as before. At the instant that the stroke passed thro' the wire it appeared to dilate a little, and after it was at its hottest, it gradually contracted after every stroke as it cooled, about one-sixteenth of an inch each time; the dilating was so very little, as to bear but a very small proportion to its contraction, and sometimes it was doubtful whether or not it did dilate at all; but after all the observations it appeared oftener as if it did dilate, than as if it did not.

34. "The same 48 feet, negatively charged to a little more than four grains, melted three inches of steel wire one hundred and seventieth of an inch thick, the same as the positive charge did in exp. 30.

"35. The same battery of 48 feet of coated surface, charged to a little more than eight grains, melted three inches of steel wire one-hundredth of an inch thick. This is very nearly in proportion to exp. 27, but here the charge was negative, and the fusion was the most pleasing of any I have hitherto had; probably owing to the charge, by chance, happening to be so well adjusted as to be exactly sufficient to melt the wire and no more: it held hot the longest, and the fused metal ran into the large globules: probably the

length of the time that the heat continued, was owing to the charge being just sufficient, and to the size of the lumps that the fused metal formed itself into.

"36. A repetition of exp. 1. with twelve inches of steel wire, one-hundredth of an inch thick, but with this difference, that as then I used only nine bottles, containing about 16 square feet of coated surface charged to 32 grains, I here used 18 bottles containing about 32 square feet of coating charged to only 16 grains. This was done, to observe the progress of the destruction of the wire, as in exp. 32, as well as to prove the similarity of the effect. The wire being the same size, sort of metal, and length, as recited just above; the first stroke made it fairly red-hot the whole length of it with smoke and smell, changed its colour to a kind of copperish hue, and shortened it considerably; the second stroke made it of a fine blue, but it did not appear red, and shortened it more; at the third stroke, it became zigzagged, many radii were very visible at the bendings, and continued to shorten till the eleventh stroke, when one of the bottles in the second row of the battery was struck through: the fracture was covered over with common cement, its place supplied by changing place with one in the third row, supposing the mended one to be the weakest; and thus, with the battery in this state, I made the twelfth stroke, which separated the wire, as in exp. 1. but this wire was shortened only one inch.

"37. A charge of 48 feet to eight grains, sent through three inches of copper wire one hundred and seventieth of an inch thick, seven times, made it zigzagged, but not much shorter; the eighth stroke separated it at one end, close to the forceps which held it, but it did not appear to be made sensibly red-hot at all, notwithstanding it must have been often so at the place where it was melted: which space was so very small as barely to be perceptible, like as when a point is set upon any flat surface of iron, and a stroke from a pound phial being sent through, both the point and the flat surface where the point rested, if examined with a magnifying glass, will be found to have been melted; and a speck may be seen; but the redness of the metal will scarcely be visible.

"38. A charge of 48 feet, to 16 grains, was sent through six inches of lead wire one-fiftieth of an inch thick, which melted it into many pieces.

"39. A charge of 48 feet, to 15 grains, was sent through six inches of wire like the last, which did not separate it, but made it smoke.

"40. A charge like the last was sent through the last piece of wire a second time; which melted it into several pieces.

"The law by which wires resist destruction, in proportion to the thickness of the wire, does not seem to be so equable, by much, in the lead as in the steel wire. For a charge of four grains, in exp. 34. melted three inches of lead wire one-sixty-sixth of an inch thick: but it took a charge of about three times that power to destroy three inches of lead wire one-fiftieth of an inch thick; which is about double the quantity of metal in the same length as in that of one sixty-sixth of an inch thick. Thus it is easy to find, what different resistance a wire of any of the foregoing metals, of equal size and length, will make to the electrical stroke or to lightning,

"The length of the electric circuit, in which the different wires were placed, in the foregoing experiments, from the nearest part of the inside to the nearest part of the outside of the battery, exclusive of the length of the said wires, was about eight feet.

"Notwithstanding the easy destruction of the lead wire by the electrical stroke, it seems greatly to be doubted, whether any thunder strokes happen in any place whatever, strong enough to destroy a strip of lead four inches broad and of the thickness of about eight pounds to the foot. Whence it may be presumed, that such a strip of lead may be perfectly safe for conductors through buildings of any kind whatever: as it is not much subject to decay in any common exposure.

"41. Two gentlemen coming in to see a piece of wire melted by electricity, I proceeded to show it them, by fixing 12 inches of steel wire one-hundred and seventieth of an inch thick, in the forceps, and then (supposing the electrometer and all other things ready placed) to charge the battery, but the electrometer did not move; nevertheless I continued charging as I supposed; but still the electrometer remained as it was, although I had been charging much longer than would have been necessary, contrary to my design, which was to take a small wire, that a small charge might be sufficient. Having been charging a long time, I left off to look about the apparatus, in order to see if any thing was not right: as I was looking, I found there was no communication to the electrometer, and heard a small crackling in the battery, which convinced me that it was charged. Accordingly I made the discharge, expecting nothing unusual; but the wire was dispersed seemingly in a very violent manner. The report was so very loud that our ears were stunned, and the flash of light so very great, that my sight was quite confused for a few seconds. The singularity of the appearances attending this experiment led me to infer it."

Though from what has been said under section VI. the direction of the electric fluid *outwards* from a body positively electrified, and *inwards* from one negatively so, seems to be sufficiently ascertained, yet some experiments related by Mr Nicholson in the last volume of the Philosophical Transactions, which seem to militate against this doctrine, require a particular consideration; and for this reason we shall here not only give an account of these, but of some others made on the subject of excitation, and the state of a charged phial in general, which seem to throw some light upon the subject. Mr Milner, who has been at great pains to inquire into this matter, makes the following observations:

"I. In the charged phial, when the inside has either kind of electricity communicated to it, the outside is found to possess a contrary power. It appears also from the preceding experiments, that either kind of electricity always produces the other on any conducting substance placed within the sphere of influence. And as the same effect is also produced on electric selves, in the same situation, and as some portion of the air, supposing no other substance to be near enough, must be unavoidably exposed to such influence, it necessarily follows, that neither power can exist without the other; and therefore, in every possible case,

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Lead more easily destructible than any other metals.

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Violent explosion from an electric battery.

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Milner's account of the Leyden phial.

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positive and negative electricity are inseparably united.

"II. A phial cannot be fully charged, by which the outside acquires a contrary electricity, unless the external coating has a communication by some conductor with the earth. In the same manner, a full charge of the contrary electricity cannot readily be procured in these experiments without a similar communication.

"III. In both cases the interposition of an electric body between the contrary powers is absolutely necessary. In one case that body is glass, in the other it is air; and the experiment will not succeed in either, unless both the glass and the air be tolerably free from moisture.

"IV. It appears from the 18th experiment, that the influence of electricity acts in the same manner through glass as it does through the air, and produces a contrary power in both cases.

"V. A communication of the electric matter is more easily made through the fluid yielding substance of the air than through glass; which is so hard and solid a body, as to require a very considerable degree of power to separate its component particles: this, however, sometimes happens, and a hole is made thro' the glass itself, without design, in attempting to charge a very thin phial as high as possible, in the most favourable state of the atmosphere.

"VI. A conducting body receives the strongest charge of the contrary electricity, in these experiments when it is brought as near as possible to the electric power, without being within the communicating distance. And it is well known that the thinnest phial, if it be strong enough to prevent a communication between the two surfaces, will always receive the highest charge.

"VII. The electricity of the external surface of the charged phial cannot be destroyed, so long as the internal surface remains in force, and continues to exert its influence through the glass; because this influence was the cause of the contrary electricity on the external surface, and must therefore preserve it.

"VIII. If part of the course which the electric matter takes in discharging a phial be through the air, a small part of the charge will always remain; because the whole of the redundancy on one surface is not capable of forcing a passage through the resisting medium of the air, in order to supply the deficiency on the other surface. But if every part of the circuit, from the internal to the external coating, consists of the best conductors, and if the coated surfaces be nearly equal, and directly opposite to each other, the phial will then appear to have retained no part of the charge, so far as it is covered with tin-foil; but the parts of it above the coating on both sides will, however, still retain the contrary electricities, after the circuit has been completed.

(c). A residue of the charge may also be observed in every other instance of electrification, in which the degree of electricity is sufficient to force a communication between the electrified body and a conductor not insulated, through a small portion of the air; and if the experiment be carefully made, it will appear, that the whole of the redundancy is not capable of passing through the resisting intermediate air, in any case, and therefore a part of the charge must always remain. This may be conveniently shown by using a well excited electrophorus of about five inches diameter, the metal cover of which may be so strongly electrified, as to force a communication through the air, to any good conductor not insulated, at the distance of three quarters of an inch. After this, a second communication much weaker than the first may be made at the distance of about the twelfth part of an inch, which is the residue of the charge, or rather a part of it: for if the second communication be carefully made through the air, without touching the cover, it will be found still to have retained enough of the first charge to electrify a pair of vertical needles.

"As it appears from this view, that both these cases are similar in so many remarkable particulars, it follows, that they are essentially the same, notwithstanding they differ in the degree of power and some other circumstances, which may alter the form of an experiment without changing its nature. It is apprehended, therefore, that the above mentioned distinction will not only appear to be unnecessary, but also that either power cannot possibly exist without the other, as it has been shown under the first particular, that positive and negative electricity were inseparably united. But here it will be proper to examine more particularly the nature of charged glass.

"1. When a plate of coated glass has been charged, and the circuit between the coatings has been completed, by the mediation of a good conducting substance, no part of the coated surface is supposed to retain any part of the charge; but, according to the commonly received doctrine, the whole of it is said to be discharged; or in other words, to be brought into its natural state. This, however, is not really the case, as will evidently appear from the following experiment; the design of which is to show the effects produced by charging and discharging a plate of glass.

"2. Let the middle of a piece of crown window-glass, seven inches square, be placed between two circular plates of brass, about the 16th part of an inch thick, and five inches in diameter. In order to enable these plates to retain a greater degree of power, it will be proper to terminate each of them with a round bead the third part of an inch thick; and the whole of the bead should be formed on one side of the plate, that the other side may remain quite flat, and apply well to the surface of the glass. Let the whole be insulated

"(c) The whole remainder of the charged phial must not, however, be ascribed to the cause above mentioned; for after taking away that part of it belonging to the coated surface, which could not force a passage through the air, if the phial be allowed to stand a short time on the table, the coated surface will again gradually acquire some power, which must be derived from the charge of the phial above the coating. Another source of the residuum will appear in the next experiment."

lated about four inches above the table, and in an horizontal position, by fastening one end of a cylindrical piece of some good insulating substance to the middle of the under plate, the other end of it being fixed in any convenient stand. Let a like insulating stem be fastened to the middle of the upper plate. Let a brass chain, which may easily be removed, reach from the under plate to the table. In the last place, bend a piece of brass wire into such a shape that it may stand perpendicularly on the upper plate; and let the upper extremity of this wire be formed into an hook, that it may be removed at any time by the assistance of a silk string, without destroying the insulation of the plate.

“3. The glass being thus coated with metal on both sides, and having also a proper communication with the table, will admit of being charged; and both coatings may be separated from the glass, and examined apart, without destroying the insulation of either: for the upper coating may be separated by the means of its own proper stem; and the under coating may be separated by taking hold of the corners of the glass, and lifting the glass itself. As glass readily attracts moisture from the atmosphere, it will therefore be necessary to warm it in the beginning, and to repeat it several times in the course of the experiment, unless the air should be very dry.

“4. Excite a smooth glass tube, of the common size, by rubbing it with silk, and apply it repeatedly to the bent wire until the glass be well charged. Then remove the chain, which reaches from the lower plate to the table, and also the charging wire from the upper plate, by laying hold of its hook with a silk string. It necessarily follows, from considering the quality of the power employed in the present case, that the upper surface of the glass, together with the upper coating, must be electrified positively; and that the under surface and coating must be electrified negatively: but as it is designed in this experiment to examine the powers of charged glass, that no virtue may be imputed to the glass but what really belongs to it, let both coatings be separated from it; and after they have been brought to their natural state, by touching them with a conducting body not insulated, let the glass be replaced between them; and whatever effects may now be produced, must be ascribed solely to the powers of the charged glass. On bringing a finger near the upper coating, a small electrical spark will appear between that coating and the finger, attended with a snapping noise. Apply a finger in the same manner to the under coating, and the same thing will happen. This effect cannot be produced twice, by two succeeding applications to the same coating; but it may be repeated several hundred times over, in a favourable state of the atmosphere, by alternate applications to the two coatings; and the powers of the glass will be thus gradually weakened.

“5. This part of the experiment may be explained, by observing, that the contrary electricities have a natural tendency to produce, and to preserve each other, on the opposite sides of a plate of glass; and therefore, the increase or decrease of power, on either surface, must be regulated by the increase or decrease of the contrary power on the other side: and as in charging a plate of glass positively, no gradual addition of elec-

tric matter can be made to the upper surface, without a proper conveyance for a proportionable part to pass away from the lower surface; so in this method of uncharging it, the electric matter cannot be gradually taken away from the upper surface, without adding a proportionable part to the under surface: one operation is the reverse of the other, and so are the effects; one case being attended with an increase and the other with a decrease of power.

“6. Let the glass be again fully charged, and after bringing both coatings to their natural state as before, let the glass be replaced between them; and on touching the upper coating with a finger, and then separating it from the upper and positive surface of the glass by the insulating stem, this coating will acquire a weak negative power, which will be sufficient to produce a small spark while the glass is in full force, though after the power of the glass has been reduced, it will give little or no spark: but, in both cases, on touching the coatings alternately two or three times, the negative power of this coating, when separated from the positive surface of the glass, will be so considerably increased, as to produce strong negative sparks.—This effect may now be repeated several times, by only touching the upper coating, but the sparks will grow weaker every time; and they may be restored again to nearly their former strength, by alternate applications to both coatings, as before. The same things will also happen to the under coating, in the same circumstances; but with this difference, that the power of the under coating, on being separated from the under and negative surface of the glass, will be positive. And thus a long succession of both positive and negative sparks may be produced in favourable weather; or at any time by keeping the glass moderately warm.

“7. It appears from this part of the experiment, that each of the surfaces of the charged glass has a power of producing a contrary electricity in the coating in contact with it, by a momentary interruption of the insulation. It necessarily follows in producing these effects, that more electrical matter must have passed away from the upper coating, at the time of touching it, than the same coating could receive from the upper surface of the glass; and therefore, the upper coating, by losing some of its natural quantity, will be negatively electrified: and also, that more electric matter must have been added to the under coating at the time of touching it, than the under surface of the glass could receive from it; and therefore the under coating, by receiving some addition to its natural quantity, will be positively electrified. It appears further, that the greatest degree of this influential power, which may be consistent with the circumstances of the case, will be produced in either coating, by taking care at the same time to bring the opposite coating into a like state of influential electricity: and thus it is evident, that the influential powers of the two coatings have the same relation to each other as the contrary powers of the glass itself, and will therefore always increase or decrease together.

“8. The glass being again well charged as at first, let a brass wire bent in the form of a staple be brought in to contact with the upper and lower coating at the same time. By this the common discharge will be made: but the equilibrium of the coated glass will be only

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only restored in part; for a considerable degree of attraction will happen at the same time between the upper coating and the glass, which has frequently been strong enough to lift a piece of plate-glass weighing ten ounces (H). Neither coating will now show the least external sign of electricity while it is in contact with the glass; but on separating either of them from it, if care be taken to preserve their insulations, the upper coating will be strongly electrified negatively, and the under coating will be strongly electrified positively. Let then both coatings be brought to their natural state, by touching them when separated from the glass, with a conducting body not insulated, and let the glass be replaced between them as before. In this state of things, on touching the upper coating only, and separating it from the glass, it will not be capable of giving any spark; but on touching the coatings alternately five or six times, it will then give a weak spark; and this may now be repeated several times by only touching the upper coating; but on a second application of the bent wire to both coatings at the same time, a second discharge may be perceived, though much weaker than the first, and the coatings will be again brought into the same electrical state as immediately after the first discharge. This may frequently be repeated; and a considerable number of strong negative sparks may be taken from the coating when it is separated from the positive surface of the glass. If the glass in replacing it between the two plates be turned upside down, the electrical powers of both coatings will be changed by the next application of the discharging wire to complete the circuit; and a succession of strong positive sparks may be taken from the coating when it is separated from the negative surface of the glass.

"9. It appears from this part of the experiment, that the coated part of the charged glass was not brought into its natural state by completing the circuit between the coatings; but that it still retained a degree of permanent electricity; that the powers of both coatings were actually changed at the time of the first discharge; and that a succession of the same powers may be produced in the coatings, without renewing the least application of electricity to the glass itself.

"10. The whole quantity of electric matter added to the glass in charging it, is evidently distinguished into two parts in this experiment. The first part, which is by far the most considerable, appears to have been readily communicated from one surface of the glass to the other, along the bent wire, when it was first brought into contact with both coatings at the same time. The second part of the charge appears to be more permanent, and remains still united with the glass, notwithstanding the circuit has been completed (1). This

permanent electricity, as well as the other, must be positive on the upper surface, and negative on the lower surface; because, in the present experiment, the charge was given by a smooth glass tube excited with a silk rubber. Now, the influence of the opposite and permanent powers on the different sides of the glass (each side having a tendency to bring the coating in contact with it into a state of electricity contrary to its own) must assist each other, in causing part of the electric matter naturally belonging to the upper coating to pass away from it to the under coating, along the discharging wire, and at the same time the surcharge to pass the same way. The upper coating, therefore, by losing some part of its natural quantity, must be negatively electrified; and the under coating, by receiving an addition to its natural quantity, must be positively electrified. The whole quantity of electric matter, which the influence of the permanent electricity of the glass is capable of taking from one coating and of adding to the other, bears but a small proportion to the whole charge; and therefore the second and every subsequent discharge must be considerably weaker than the first.

"11. It appears from several of the preceding experiments, that a considerable degree of influential power may be produced at some distance by an electric in full force; and therefore a small excited body of a cylindrical shape was sufficient to answer that purpose: but when the excited electric has been so far weakened that it cannot communicate its own power, nor produce this influential power in any body, unless it be brought very near or in contact with it, bodies of a cylindrical form must then act to great disadvantage, and a small degree of power only can be produced; because the strength of the influential electricity in this case will be in proportion to the surfaces of the electric and conducting bodies, which are brought near together, or in contact with each other; and therefore a plate of glass in the same circumstances, whether its permanent power be derived from excitation or communication, is enabled from its shape to produce a considerable degree of the influential powers in the coatings in contact with it.

"12. It appears from this experiment, that the ingenious professor Volta's electrophorus is, in reality, a resinous plate charged with permanent electricity by friction; and because there is a less disposition in a body of this kind to attract moisture from the atmosphere than there is in glass; it will retain the power better, and consequently be the longer capable of producing a contrary electricity in the insulated metal cover. If it should be thought necessary to support this observation by a direct experiment, it may easily be done by making a thin flat plate of any resinous electric substance, and larger than the insulated cover, but without fastening

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Hypothesis concerning the electrophorus.

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"(H) The whole of this effect must not be ascribed to the attraction of electricity. Perhaps the passage of electric matter between the coating and the glass may help to exclude the air; and then the attraction of cohesion, and the pressure of the external air both above and below, may be supposed to have the most considerable share in producing this effect.

"(1) Some new terms seem to be wanted in order to express with precision the different parts of the charge. And if that part of it which cannot be destroyed by completing the circuit, should be called the *permanent part of the charge*, or more simply the *charge*; then might the other part, or that which may be destroyed by completing the circuit, be named the *surcharge*.

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a coating to either surface; and then, whether this plate be charged by excitation or communication, one of its sides will be positive and the other side negative; and a succession of positive sparks may be produced on the negative side, and of negative sparks on the positive side, by a proper application of the insulated metal cover. It will be also found, that this retentive plate cannot be well charged, either by excitation or communication, unless a coating of some conducting matter should be kept in contact with the under surface; and it should also have some communication with the floor.

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How to charge a phial without friction.

"13. It has been very properly recommended to use a particular kind of rubber, and to attend to the state of it, in order to excite glass well; but it will not be necessary to pay the least regard to these circumstances in the following experiments, in which a method will be shown of charging a small phial and a plate of glass at the same time, by a gradual accumulation of power; that power being entirely derived from the glass itself, and with no other degree or kind of friction than is necessarily connected with the form of the experiment.

"14. Place a circle of tin-foil five inches in diameter on the table, between a soft piece of baize and the middle of the same plate of glass that was used in the last experiment, which will thus be coated on the under side; and in order to preserve a proper communication with this coating, let a fillet of tin-foil reach from it beyond the extremity of the glass. The same insulated metal cover is to be used for the upper coating as before. Let a thin ounce-phial of glass be filled with brass filings, and coated with tin-foil on the outside to about one inch from the top. Let a large brass wire, the fifth part of an inch in diameter, pass through the cork of the phial into the filings, about an inch of it being left above the cork, and let the upper extremity of this wire be well rounded. This experiment requires, that the whole construction should be well warmed at first; and it will be necessary to repeat it at proper intervals, unless the atmosphere should be very dry.

"15. Taking hold of the wire of the phial with one hand, let it be placed on the upper surface of the glass, and its bottom carried in contact over the middle of the upper surface, as far as the tin-foil coating reaches on the under side: and during this part of the operation, a finger of the other hand must be kept in contact with the fillet of tin-foil. Then lifting the phial by the wire with one hand, let it be placed on the insulated metal cover, suspended in the air with the other hand; and after shifting the hand from the wire to the coating, let the bottom of the phial be placed on the end of the tin-foil fillet. Place the insulated metal cover on the middle of the glass, and touch it with a finger of one hand, while the other hand touches the tin-foil fillet. Now lift the insulated cover by its stem, and bring the head of the cover in contact with the wire of the phial, and a very small spark of light will appear between them. Let this be repeated in the same manner about 15 times, taking care to preserve a proper communication between the coating and the floor. Then taking hold of the phial by the coating, let it be replaced on the insulated cover while it is suspended in the air; and after shifting the hand from the coating to the wire, let it be

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again placed on the middle of the glass, and let the bottom be again carried in contact over the middle of the glass, holding the wire in one hand, while the other has a proper communication with the tin-foil coating. Let the phial be again returned to the tin-foil fillet as before, and let the insulated cover be applied repeatedly to the wire, immediately after every separation from the glass; and a brighter spark, together with a weak snapping, will now attend each application, if it be carefully observed to touch the cover with one hand before every separation, while the other hand rests on the fillet of tin-foil. By proceeding in this manner, after the third application of the phial to the glass, a very weak shock will be felt in those fingers which are used in completing the circuit of the glass; and after repeating two rounds more in the manner before mentioned, the phial will be fully charged. By applying the coating of the phial when it is in full force to the upper surface as before, the glass plate will get the greatest power it is thus capable of receiving, and will then give a shock as high as the elbows. After this, on attempting to lift the insulated cover, the glass itself will generally be lifted at the same time, with the tin-foil coating adhering to the under surface: but by continuing the separations of the cover from the glass, a succession of strong negative sparks may be produced by the influence of the upper surface; and by turning the glass over, and leaving the tin-foil coating on the baize, a succession of strong positive sparks may be produced by the influence of the other side.

"16. This experiment may be performed more steadily by placing the glass, together with the tin-foil coating and baize, on a plate of metal about $\frac{1}{4}$ th of an inch thick, and of the same square as the glass. The whole may be fastened together by two small holdfasts placed at the opposite corners, which will prevent the glass from being lifted. This plate of metal will be useful in another view; for after it has been sufficiently warmed, by retaining heat well, it will help to keep the glass dry, and consequently fit for use so much the longer. But when it shall be required to show the contrary powers of the opposite sides of the glass, it will be more convenient not to fasten the parts together, and the whole may be kept sufficiently steady, by the operator's keeping down one corner of the glass with a finger, and by placing a proper weight on the opposite corner.

"17. The bottom of the phial cannot be carried in contact over the glass without producing some little degree of friction; from which the power in this experiment is originally derived. The cover will appear on examination to be electrified negatively after every separation from the glass: but as it was touched in completing the circuit between the coatings before every separation, it necessarily follows, that the cover can have only an influential electricity, and consequently that the permanent power of the upper surface of the glass must be positive. The negative power of the cover is communicated to the wire of the phial, by which the inside is electrified negatively and the outside positively; and both these powers will increase with every application, because the circumstances of the phial are favourable to its charging. The phial must be insulated every time it is required to shift the hand from the wire to the coating, or from the coating to the wire; for

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for without this precaution the phial would be discharged. By applying the outside of the phial to the upper surface of the glass, in the manner above mentioned, the phial will be partly discharged on that surface; and though it must be therefore weakened, the power of the glass will be increased, and consequently enabled to produce a proportionably stronger effect on the brass cover, which by the next round of applications will give the phial a stronger charge than it had before. And thus a very small degree of original power is first generated, and then employed in forming two different accumulations: and by making each of these subservient to the increase of the other, the phial is at last fully charged, and the glass plate acquires such a degree of the surcharge, as to give a pretty smart shock; and after that, it remains capable, by the influence of its permanent powers, of producing a succession of positive and negative sparks on the opposite surfaces.

"18. The contrary charge may be given to the phial by taking hold of the coating, and carrying the wire in contact over the middle of the upper surface of the glass, and by applying the power of the insulated cover to the coating; for if the operation be conducted in every other respect in the same manner as before, then will the inside be electrified positively, and the outside negatively. The powers of the glass plate will be the same as they were in the former case.

"19. After the phial has been fully charged negatively, by the process of the last experiment, let it be insulated; and taking hold of the wire, let the bottom be held uppermost, and let the hand which holds it rest on the fillet of tin-foil. Apply the insulated cover to the glass, and after touching it with a finger of the other hand, separate it from the glass; and on bringing it towards the coating of the phial, a strong spark will pass between them. After repeating this between 20 and 30 times, the powers of the phial will be destroyed; and by continuing the same operation, they will be inverted; for the inside will be at last fully charged positively, and the outside negatively.

"20. The same effect may be produced, by turning the glass over, and by repeatedly applying the influential electricity, produced on that side, to the wire of the phial.

"21. When the phial has been fully charged negatively, as in the last experiment, take hold of the coating of the phial with one hand, and while the other hand rests on the tin-foil fillet, apply the wire to the middle of the upper surface of the glass, as far as the tin-foil coating extends on the other side. By this the powers of the glass plate will be changed.

"22. Another, and perhaps a better method of applying the phial, is to place the insulated cover on the surface of the glass, and then holding the phial by the coating in one hand, to apply the wire to the cover, while the other hand touches the fillet of tin-foil; by which a shock will be given, and the same change of powers will be produced in an instant, which before took up some little time. On lifting the insulated cover by its stem immediately after the shock, it will be negative, or have the same power as the inside of the phial; but on replacing the cover, and completing the circuit of the glass plate, the surcharge will be destroyed; another shock will be felt; and the power of the cover, after the next separation, will be positive, or contrary to that of the inside of

the phial. Apply this positive power to the wire of the phial as before; and after 15 applications, the powers of the phial will be destroyed: and by still proceeding in the same manner, the powers of the phial will be changed, and the inside will be fully charged positively and the outside negatively, by 60 applications.

"23. These effects may also be produced by a single application of the coating of the phial to the other side of the glass plate; and by repeated applications of the influential electricity, produced on the same side, to the coating of the phial.

"24. If it were simply the object in this experiment to change the powers of the phial, the operation might then be considerably shortened, by completing the circuit of the phial, and consequently destroying the whole surcharge: but it was intended to show what effects might be produced, by opposing the contrary powers to each other; and by doing this it appears that either side of the glass plate can destroy the powers of the phial, and give it a contrary charge; that either side of the phial can also change the powers of the glass plate; and that the powers of the glass plate, thus inverted, can again destroy the powers of the phial, and give it a full charge of the contrary electricity.

"25. Here it may be observed, that, in some cases, the quality of the power may be determined by observation alone. When the phial employed in the two last experiments has been fully charged, it may be known whether the inside be positive or negative from the light which appears at the wire, or from the hissing noise which attends it: for when the phial has been fully charged positively, if the room be sufficiently darkened, a bright luminous appearance may be seen, diverging in separate rays to the distance of an inch, attended with an interrupted hissing noise; and both the light and the noise continue a very short time. But when the phial is fully charged negatively, a weaker and more uniform light appears, which does not extend itself more than the sixth part of an inch, and is attended with a closer and more uniform hissing; and this noise and light always continue longer than the former. Even positive and negative sparks, passing between the insulated cover and a finger, may be distinguished from each other: for the positive sparks are more divided, give less light, make a weaker snapping noise, and affect the finger less sensibly than the negative.

"26. The strongest sparks which can be produced in these experiments, are those that pass between the coating of the phial and the insulated cover, when they possess contrary powers; but they will be more particularly vigorous, if the coating be positive and the insulated cover negative."

In Sect. vi. of this treatise we have related some experiments, tending to show, that in the act of charging a phial with positive electricity, both became positive; and in the act of charging one negatively, both became negative. These were inserted in the former edition of this work; since which time Mr Brookes at Norwich has published a treatise; in which he not only adopts the opinion, but lays claim to it as his discovery, from some letters wrote in the year 1775. His experiments are extremely well adapted to elucidate the point intended; and the most remarkable of them are as follow:

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" 1. Let two pound phials be coated with tin-foil on their outides, and filled to a convenient height with common shot, to serve as a coating within-side, as well as to keep a wire steady in the phials without a flopple in the mouth of them. Let each phial be furnished with a wire about the size of a goose-quill, and about ten inches long, and let each wire be sharpened a little at one end, that it may the more easily be thrust down into the shot, so as not to touch the glass any where at the mouth of the phials, yet so as to stand steadily in them. Let a metallic ball about six or seven eighths of an inch diameter be screwed on at the other end of each wire: also let there be in readiness a third wire, fitted up like those for the phials, except that another ball of nearly the same size as the former may occasionally be screwed on over the sharpened end of it. I say, instead of suspending the phials from the prime conductor as before, let one of those above described be charged at the prime conductor, and then let it aside, but let it be in readiness in its charged state: then let the other be placed upon a good insulating stand, and let the third wire also be laid upon the stand, so that its ball, or some part of the wire, may touch the coating of the phial. Let the sharpened end of this wire project five or six inches over the edge of the stand: all of these being now placed close to the edge of a table, hang a pair of cork balls on the sharpened end of the wire, and make a communication from the prime conductor to the ball on the wire on the bottle: on working the machine, the sharpened end of the wire will permit the bottle to be charged although it be insulated; and if the wire be very finely pointed, the bottle may be charged nearly as well as if it were not insulated: I say, on working the machine, the phial will charge, and the cork balls will immediately repel each other; but whilst this phial is charging, take the first phial, which having been previously charged at the same prime conductor in the hand, and while the second phial is charging, present the ball of the first to the cork balls, and they will all repel each other. This plainly proves that the outside of the second bottle is electrified plus at the time that it is charging, the same as the inside of the first; and the inside of both the bottles will readily be allowed to be charged alike, that is, plus or positive.

" 2. Let the second bottle in the last experiment be wholly discharged, and charge it again as before (the first bottle yet remaining charged), and whilst it is charging, let the ball of the first approach the cork balls contiguous with the second, and they will, as before, all repel each other: withdraw the ball of the first, and so long as the machine continues to charge the second bottle higher, the cork balls will continue to repel each other; but cease working the machine, and the cork balls will cease to repel each other till they touch, and will then very soon repel each other again; then let the ball in the first phial approach the cork balls, and they will now be attracted by it, instead of being repelled as above, as in the last experiment. This also plainly shows, that both sides of a Leyden phial are alike at the time it is charging; and at the same time evidently shows, that the difference of the two sides does not take place till after the bottle is charged, or till the machine ceases to charge it higher.

" 3. In this experiment, let both the former bottles be discharged, then let one of them be placed upon the insulating stand. Let a ball be put on over the sharpened end of the third wire, and let it be laid on the stand as before, so as to touch the coating of the phial: place the other phial on the table, so that its ball or wire may touch the ball on the third wire, or any part of the wire itself: make a communication from the ball on the wire of the first phial to the prime conductor: then, by working the machine, both bottles will soon become charged. As soon as they are pretty well charged, and before the machine cease working, remove the second phial from the third wire; after the second phial is removed, cease working the machine as soon as possible: take the third wire, with its two balls, off the stand with the hand, and lay it on the table, so that one of its balls may touch the outside coating of the second phial: remove the first phial off the stand, and place it on the table so as to touch the ball at the other end of the third wire; then, with an insulated discharging rod, make a communication from the ball in one bottle to the ball in the other: if the outside of the first phial be negative at the time it is charging, the inside of the second will be the same, and making the above communication would produce an explosion, and both bottles would be discharged; but the contrary will happen, for there will be no explosion, nor will either of the bottles be discharged, although there be a complete communication between their outides, because the inside of them both will be positive. This is a proof, that considering one side of a phial to be positive and the other negative at the time they are charging, is a mistake: as well as that, if any number of bottles be suspended at the tail of each other, all the intermediate surfaces or sides do not continue so.

" 4. Here also let the apparatus be disposed as in the last experiment, till the bottles are highly charged: then, with a clean stick of glass, or the like, remove the communication between the ball of the first phial and the prime conductor before the machine ceases working; then, with an insulated discharging rod, make a communication from the outside to the inside of the first phial; a strong explosion will take place on account of the excess within-side, notwithstanding they are both positive.

" 5. This experiment being something of a continuation of the preceding one, immediately after the last explosion takes place, discharge the prime conductor of its electricity and atmosphere; then touch the ball in the first phial with the hand, or any conducting substance that is not insulated; then will the inside coating of the first phial, which at first was so strongly positive, be in the same state as the outside coating of the second, having a communication by the hand, the floor, &c. with each other; that is, negative, if any thing can properly be called negative or positive that has a communication with the common stock: but a pair of cork balls that are electrified either plus or minus, will no more be attracted by either the inside coating of the first phial or the outside coating of the second, than they will by the table on which they stand, or a common chair in the room, while they continue in that situation. Remove the aforesaid communication from the ball of the first phial;

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phial; touch the ball in the second, as before in the first, or discharge the bottle with the discharging rod, and the ball in the first bottle will immediately become negative: with a pair of cork balls, electrified negatively, approach the ball in the first phial, and they will all repel each other, or, if the cork balls be electrified positively, they will be attracted. All these circumstances together seem fully to prove what has already been said, not only that the inside of the first phial, which was so strongly positive, may be altered so as to become in the same state as the outside of the second, without discharging the phial, or any more working the machine; but that it may be fairly changed, from being positively charged to being negatively charged. If a pair of cork balls are now hanged on to the ball of the wire in this phial, by the help of a stick of glass, they will repel each other, being negatively electrified. Make a communication from the outside of the bottle to the table, and replace the communication from the prime conductor to the ball in the bottle; then, upon moderately working the machine to charge the bottle, the cork balls will cease to repel each other till they touch, and will soon repel each other again by being electrified positively. Here the working the machine anew, plainly shows that the inside of the first bottle, which was positive, was likewise changed to negative.

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His method of preserving jars in a battery from being broke by a discharge.

"In making electrical experiments, and in particular those in which the Leyden phial is concerned (a number of which together compose most electrical batteries), a method to preserve the bottles or jars from being struck through by the electric charge is very desirable; but I do not know that it has hitherto been accomplished. The number of them that have been destroyed in the foregoing, as well as in many experiments made long before, have led me to various conjectures to preserve them: at the same time I have been obliged to make use of bottles instead of open mouthed jars. And as coating the former within-side is very troublesome, it has put me on thinking of some method more easy, quicker, and equally firm and good, as with the tin-foil. With respect to the new method of coating, I failed; though something else presented itself rather in behalf of the former: therefore introducing the process here will not be of very great use; unless in saving another the trouble of making use of the same method, or giving a hint towards the former, so as to succeed with certainty. My aim was, to find something that should be quick and clean, and not easy to come off with the rubbing of wires against it, and yet a good conductor. My first essay was with a cement of pitch, rosin, and wax, melted together; into which, to make it a good conductor, I put a large proportion of finely sifted brass filings. When this mixture was cold, I put broken pieces of it into the bottle, and warmed the bottle till it was hot enough to melt the cement in it so as to run, and cover the bottle within-side; then I coated the outside with tin-foil as is commonly done, and now it was fit for use, or ready to be charged: to which I next proceeded; and I believe I had not made more than four or five turns of the winch before it spontaneously struck through the glass with a very small charge. I then took off the outside coating, and

flopped the fracture with some of my common cement, after which I put the coating on again; and, in as little time as before, it was struck through again in a different place: and thus I did with this bottle five or six times; sometimes it struck through the cement, but it struck through the glass in four different places. This made me consider what it might be that facilitated the spontaneous striking through the glass, and likewise what might retard it. I had long before thought that jars or bottles appeared to be struck through with a much less charge, just after their being coated, or before they were dry, than when they had been coated long enough for the moisture to be evaporated from the paste with which I mostly lay on the tin-foil; and could only consider the dry paste as a kind of mediator between the tin-foil and the glass, or, in other words, that the moisture in the paste was a better conductor, and more in actual contact with the glass, than the paste itself when dry. And the coating the bottles with the heated cement, though long afterward, did not alter my former idea; for it appeared as if the hot cement, with the conducting substance in it, might be still more in actual contact with the glass than the moisture in the paste. On these probabilities I had to consider what might act as a kind of mediator more effectually than the dry paste between the glass and the tin-foil. It occurred, that common writing-paper, as being neither a good conductor nor insulator, might be serviceable by being first pasted smoothly to the tin-foil and left to dry. The paper then being pasted on one side, having the tin-foil on the other, I put them on the glass together with the tin-foil outward, and rubbed them down smooth. This succeeded so well that I have never since had any struck through that were thus done, either common phials, or large bottles which contain near three gallons each, though some of the latter have stood in the battery in common use with the other a long time. And as I have never had one struck through that has been prepared in this way, I am much less able at present to tell how great a charge they will bear before they are struck through, or whether they will be struck through at all."

In the last part of the Philosophical Transactions for 1789, we have the following experiments by Mr Nicholson, on an improved method of excitation, as the action of points, and the direction of the fluid &c. in positive and negative electricity.

1. A glass cylinder was mounted, and a cushion applied with a silk flap, proceeding from the edge of the cushion over its surface, and thence half round the cylinder. The cylinder was then excited by applying an amalgamed leather in the usual manner. The electricity was received by a conductor, and passed off in sparks to Lane's electrometer. By the frequency of these sparks, or by the number of turns required to cause spontaneous explosion of a jar, the strength of the excitation was ascertained.

"2. The cushion was withdrawn about one inch from the cylinder, and the excitation performed by the silk only. A stream of fire was seen between the cushion and the silk; and much fewer sparks passed between the balls of the electrometer.

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Glasses easily broke by electricity when covered with cement.

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Nicholson's experiments on well excitation,

"3. A roll of dry silk was interposed, to prevent the stream from passing between the cushion and the silk. Very few sparks then appeared at the electrometer.

"4. A metallic rod, not insulated, was then interposed instead of the roll of silk, so as not to touch any part of the apparatus. A dense stream of electricity appeared between the rod and the silk, and the conductor gave very many sparks.

"5. The knob of a jar being substituted in the place of the metallic rod, it became charged negatively.

"6. The silk alone, with a piece of tin-foil applied behind it, afforded much electricity, though less than when the cushion was applied with a light pressure. The hand being applied to the silk as a cushion, produced a degree of excitation seldom equalled by any other cushion.

"7. The edge of the hand answered as well as the palm.

"8. When the excitation by a cushion was weak, a line of light appeared at the anterior part of the cushion, and the silk was strongly disposed to receive electricity from any uninsulated conductor. These appearances did not obtain when the excitation was by any means made very strong.

"9. A thick silk, or two or more folds of silk, excited worse than a single very thin flap. I use the silk which the milliners call Persian.

"10. When the silk was separated from the cylinder, sparks passed between them; the silk was found to be in a weak negative, and the cylinder in a positive, state.

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The silk flap the principal cause of excitation.

"The foregoing experiments show that the office of the silk is not merely to prevent the return of electricity from the cylinder to the cushion, but that it is the chief agent in the excitation; while the cushion serves only to supply the electricity, and perhaps increase the pressure at the entering part. There likewise seems to be little reason to doubt but that the disposition of the electricity to escape from the surface of the cylinder is not prevented by the interposition of the silk, but by a compensation after the manner of a charge; the silk being then as strongly negative as the cylinder is positive: and, lastly, that the line of light between the silk and cushion in weak excitations does not consist of returning electricity, but of electricity which passes to the cylinder, in consequence of its not having been sufficiently supplied during its contact with the rubbing surface.

"11. When the excitation was very strong in a cylinder newly mounted, flashes of light were seen to fly across its inside, from the receiving surface to the surface in contact with the cushion, as indicated by the brush figure. These made the cylinder ring as if struck with a bundle of small twigs. They seem to have arisen from part of the electricity of the cylinder taking the form of a charge. This appearance was observed in a 9-inch and a 12-inch cylinder, and the property went off in a few weeks. Whence it appears to have been chiefly occasioned by the rarity of the internal air produced by handling, and probably restored by gradual leaking of the cement.

162
State of the inside of a cylinder during excitation determined.

"12. With a view to determine what happens in the inside of the cylinder, recourse was had to a plate machine. One cushion was applied with its silken flap. The plate was 9 inches in diameter and $\frac{3}{4}$ ths of an inch thick. During the excitation, the surface oppo-

site to the cushion strongly attracted electricity, which it gave out when it arrived opposite to the extremity of the flap: so that a continual stream of electricity passed through an insulated metallic bow terminating in balls, which were opposed, the one to the surface opposite the extremity of the silk, and the other opposite to the cushion; the former ball showing positive and the latter negative signs. The knobs of two jars being substituted in the place of these balls, the jar applied to the surface opposed to the cushion was charged negatively, and the other positively. This disposition of the back surface seemed, by a few trials, to be weaker the stronger the action of the cushion, as judged by the electricity on the cushion side.

"Hence it follows, that the internal surface of a cylinder is so far from being disposed to give out electricity during the friction by which the external surface acquires it, that it even greedily attracts it.

"13. A plate of glass was applied to the revolving plate, and thrust under the cushion in such a manner as to supply the place of the silk flap. It rendered the electricity stronger, and appears to be an improvement of the plate machine; to be admitted if there were not essential objections against the machine itself.

"14. Two cushions were then applied on the opposite surfaces with their silk flaps, so as to clasp the plate between them. The electricity was received from both by applying the finger and thumb to the opposite surfaces of the plate. When the finger was advanced a little towards its correspondent cushion, so that its distance was less than between the thumb and its cushion, the finger received strong electricity, and the thumb none; and, contrariwise, if the thumb were advanced beyond the finger, it received all the electricity, and none passed to the finger. This electricity was not stronger than was produced by the good action of one cushion applied singly.

"15. The cushion in experiment 12, gave most electricity when the back surface was supplied, provided that surface was suffered to retain its electricity till the rubbed surface had given out its electricity.

"From the two last paragraphs it appears, that no advantage is gained by rubbing both surfaces; but that a well managed friction on one surface will accumulate as much electricity as the present methods of excitation seem capable of collecting; but that, when the excitation is weak, on account of the electric matter not passing with sufficient facility to the rubbed surface, the friction enables the opposite surface to attract or receive it, and if it be supplied, both surfaces will pass off in the positive state; and either surface will give out more electricity than is really induced upon it, because the electricity of the opposite surface forms a charge. It may be necessary to observe, that I am speaking of the facts or effects produced by friction; but how the rubbing surfaces act upon each other to produce them, whether by attraction or otherwise, we do not here enquire.

163
No advantage gained by rubbing two sides of the plate machine.

"It will hereafter be seen, that plate machines do not collect more electricity than cylinders (in the hands of the electrical operators of this metropolis) do with half the rubbed surface; which is a corroboration of the inference here made.

"16. When a cylinder is weakly excited, the appearances mentioned (par. 8.) are more evident the more rapid

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164 Velocity necessary to produce the utmost degree of excitation.

165 How to produce both electricities in the same conductor.

166 Improved method of excitation.

rapid the turning. In this case, the avidity of the surface of the cylinder beneath the silk is partly supplied from the edge of the silk, which throws back a broad cascade of fire, sometimes to the distance of above 12 inches. From these causes it is that there is a determinate velocity of turning required to produce the maximum of intensity in the conductor. The stronger the excitation, the quicker may be the velocity; but it rarely exceeds five feet of the glass to pass the cushion in a second.

"17. If a piece of silk be applied to a cylinder, by drawing down the ends so that it may touch half the circumference, and the cylinder be then turned and excited by applying the amalgamed leather, it will become very greedy of electricity during the time it passes under the silk. And if the entering surface of the glass be supplied with electricity, it will give it out at the other extremity of contact; that is to say, if insulated conductors be applied at the touching ends of the silk, the one will give, and the other receive, electricity, until the intensities of their opposite flates are as high as the power of the apparatus can bring them; and these flates will be instantly reversed by turning the cylinder in the opposite direction.

"As this discovery promises to be of the greatest use in electrical experiments, because it affords the means of producing either the plus or minus flates in one and the same conductor, and of instantly repeating experiments with either power, and without any change of position or adjustment of the apparatus, it evidently deserved the most minute examination.

"18. There was little hope (par. 6.) that cushions could be dispensed with. They were therefore added; and it was then seen, that the electrified conductors were supplied by the difference between the action of the cushion which had the advantage of the silk, and that which had not; so that the naked face of the cylinder was always in a strong electric flate. Methods were used for taking off the pressure of the receiving cushion; but the extremity of the silk, by the construction, not being immediately under that cushion, gave out large flashes of electricity with the power that was used. Neither did it appear practicable to present a row of points or other apparatus to intercept the electricity which flew round the cylinder; because such an addition would have materially diminished the intensity of the conductor, which in the usual way was such as to flash into the air from rounded extremities of four inches diameter, and made an inch and half ball become luminous and blow like a point. But the greatest inconvenience was, that the two flates with the backward and forward turn were seldom equal; because the disposition of the amalgam on the silk, produced by applying the leather to the cylinder in one direction of turning, was the reverse of what must take place when the contrary operation was performed.

"Notwithstanding all this, as the intensity with the two cushions was such as most operators would have called strong, the method may be of use, and I still mean to make more experiments when I get possession of a very large machine which is now in hand.

"19. The more immediate advantage of this discovery is, that it suggested the idea of two fixed cushions with a moveable silk flap and rubber. Upon this principle, which is so simple and obvious, that it is wonderful it

should have been so long overlooked, I have constructed a machine with one conductor, in which the two opposite and equal flates are produced by the simple process of loosening the leather-rubber, and letting it pass round with the cylinder (to which it adheres) until it arrives at the opposite side, where it is again fastened. A will to avoid prolixity prevents my describing the mechanism by which it is let go and fastened in an instant, at the same time that the cushion, is made either to press or is withdrawn, as occasion requires.

"20. Although the foregoing series of experiments naturally lead us to consider the silk as the chief agent in excitation; yet as this business was originally performed by a cushion only, it becomes an object of enquiry to determine what happens in this case.

"21. The great Beccaria inferred, that in a simple cushion, the line of fire, which is seen at the extremity of contact from which the surface of the glass recedes, consists of returning electricity; and Dr Nooth grounded his happy invention of the silk flap upon the same supposition. The former asserts, that the lines of light without a both at the entering and departing parts of the surface are absolutely similar; and thence infers, that the cushion receives on the one side, as it certainly does on the other. I find, however, that the fact is directly contrary to this assertion; and that the opposite inference ought to be made, as far as this indication can be reckoned conclusive: for the entering surface exhibits many luminous perpendiculars to the cushion, and the departing surface exhibits a neat uniform line of light. This circumstance, together with the consideration that the line of light behind the silk in par. 8. could not consist of returning electricity, showed the necessity of farther examination. I therefore applied the edge of the hand as a rubber, and by occasionally bringing forward the palm, I varied the quantity of electricity which passed near the departing surface. When this was the greatest, the sparks at the electrometer were the most numerous. But as the experiment was liable to the objection that the rubbing surface was variable, I passed a piece of leather upon a thin flat piece of wood, then amalgamed its whole surface, and cut its extremity off in a neat right line close to the wood. This being applied by the constant action of a spring against the cylinder, produced a weak excitation; and the line where the contact of the cylinder and leather ceased (as abruptly as possible) exhibited a very narrow fringe of light. Another piece of wood was prepared of the same width as the rubber, but one quarter of an inch thick, with its edges rounded, and its whole surface covered with tin-foil. This was laid on the back of the rubber, and was there held by a small spring, in such a manner as that it could be slid onward, so as occasionally to project beyond the rubber, and cover the departing and excited surface of the cylinder without touching it. The sparks at the electrometer were four times as numerous when this metallic piece was thus projected; but no electricity was observed to pass between it and the cylinder. The metallic piece was then held in the hand to regulate its distance from the glass; and it was found, that the sparks at the electrometer increased in number as it was brought nearer, until light appeared between the metal and the cylinder; at which time they became fewer the nearer it was brought, and at last ceased when it was in contact.

169 In what manner excitation is performed by a simple rubber silk flap.

"The

Miscellaneous Experiments.

168 Conclusions from these experiments.

169 How to increase the intensity of electricity to a great degree.

The following conclusions appear to be deducible from these experiments. 1. The line of light on a cylinder departing from a simple cushion consists of returning electricity: 2. The projecting part of the cushion compensates the electricity upon the cylinder, and by diminishing its intensity prevents its striking back in such large quantities as it would otherwise do: 3. That if there was no such compensation, very little of the excited electricity would be carried off: And, 4. That the compensation is diminished, or the intensity increased, in an higher ratio than that of the distance of the compensating substance; because if it were not, the electricity which has been carried off from an indefinitely small distance, would never fly back from a greater distance and form the edge of light.

"22. I hope the considerable intensity I shall speak of will be an apology for describing the manner in which I produce it. I with the theory of this very obscure process were better known; but no conjecture of mine is worth mentioning. The method is as follows:

"Clean the cylinder, and wipe the silk.

"Grease the cylinder by turning it against a greased leather till it is uniformly obscured. I use the tallow of a candle.

"Turn the cylinder till the silk flap has wiped off so much of the grease as to render it semitransparent.

"Put some amalgam on a piece of leather, and spread it well, so that it may be uniformly bright. Apply this against the turning cylinder. The friction will immediately increase, and the leather must not be removed until it ceases to become greater.

"Remove the leather, and the action of the machine will be very strong.

"My rubber, as before observed, consists of the silk flap pasted to a leather, and the cushion is pressed against the silk by a slender spiral spring in the middle of its back. The cushion is loosely retained in a groove, and rests against the spring only, in such a manner that by a sort of libration upon it as a fulcrum, it adapts itself to all the irregularities of the cylinder, and never fails to touch it in its whole length. There is no adjustment to vary the pressure, because the pressure cannot be too small when the excitation is properly made. Indeed, the actual withdrawing of the cushion to the distance of $\frac{1}{16}$ th of an inch from the silk, as in par. 2. will not materially affect a good excitation.

"The amalgam is that of Dr Higgins, composed of zinc and mercury. If a little mercury be added to melted zinc, it renders it easily pulverable, and more mercury may be added to the powder to make a very soft amalgam. It is apt to crystallize by repose, which seems in some measure to be prevented by triturating it with a small proportion of grease; and it is always of advantage to triturate it before using.

"A very strong excitation may be produced by applying the amalgamed leather to a clean cylinder with a clean silk: but it soon goes off, and is not so strong as the foregoing, which lasts several days.

"23. To give some distinctive criterions by which other electricians may determine whether the intensity they produce exceeds or falls short of that which this method affords, I shall mention a few facts.

"With a cylinder 7 inches diameter and cushion 8 inches long, three brushes at a time constantly flew out

of a 3-inch ball in a succession too quick to be counted, and a ball of $1\frac{1}{2}$ inch diameter was rendered luminous, and produced a strong wind like a point. A 9-inch cylinder with an 8-inch cushion occasioned frequent flashes from the round end of a conductor 4 inches diameter: with a ball of $2\frac{1}{2}$ inches diameter the flashes ceased now and then, and it began to appear luminous: a ball of $1\frac{1}{2}$ inch diameter flung gave the usual flashes; then, by quicker turning, it became luminous with a bright speck moving about on its surface, while a constant stream of air rushed from it; and, lastly, when the intensity was greatest, brushes of a different kind from the former appeared. These were less luminous but better defined in the branches; many started out at once with a hoarse sound. They were reddish at the stem, sooner divided, and were greenish at the point next the ball, which was brass. A ball of $\frac{1}{4}$ ths of an inch diameter was surrounded by a steady faint light, enveloping its exterior hemisphere, and sometimes a flash struck out at top. When the excitation was strongest, a few flashes struck out sideways. The horizontal diameter of the light was longest, and might measure one inch, the stem of the ball being vertical.

"This last phenomenon is similar to a natural event related by M. Loammi Baldwin*, who raised an electrical kite in July 1771 during the approach of a severe thunder-storm, and observed himself to be surrounded by a rare medium of fire, which as the cloud rose nearer the zenith, and the kite rose higher, continued to extend itself with some gentle faint flashes. Mr Baldwin felt no other effect than a general weakness in his joints and limbs, and a kind of listless feeling; all which he observes might possibly be the effect of surprise, though it was sufficient to discourage him from persisting in any farther attempt at that time. He therefore drew in his kite, and retired to a shop till the storm was over, and then went to his house, where he found his parents and friends much more surprised than he had been himself; who, after expressing their astonishment, informed him, that he appeared to them (during the time he was raising the kite) to be in the midst of a large bright flame of fire, attended with flashings; and that they expected every moment to see him fall a sacrifice to the flame. The flame was observed by some of his neighbours, who lived near the place where he stood.

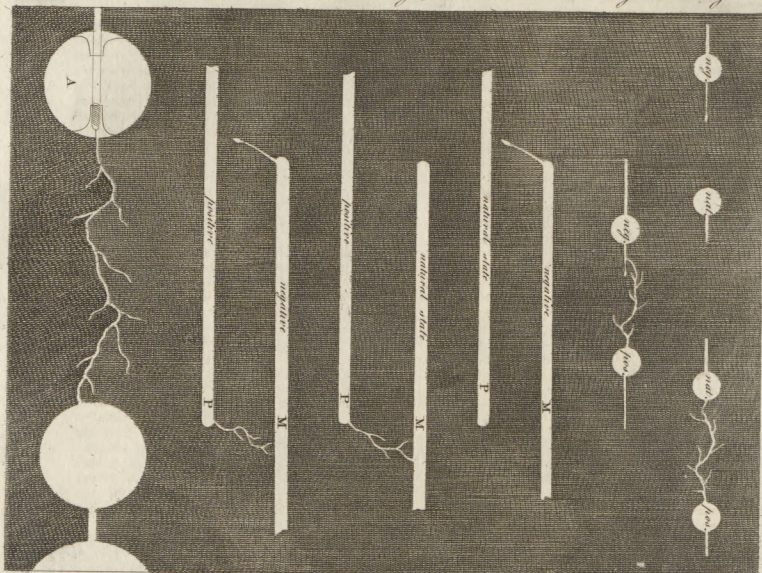
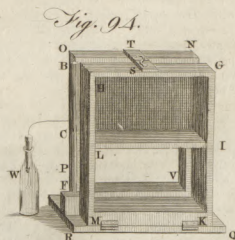
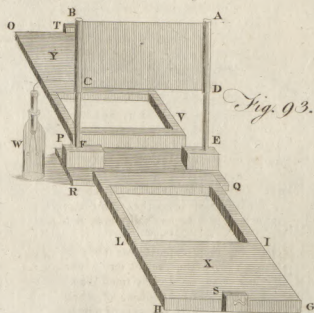
"This fact is similar to another observed by M. de Saussure on the Alps, and both are referable to my luminous ball with the second kind of brush. The cloud must have been negative.

"With a 12-inch cylinder and rubber of $7\frac{1}{2}$ inches, a five-inch ball gave frequent flashes, upwards of 14 inches long, and sometimes a 6-inch ball would flash. I do not mention the long spark, because I was not provided with a favourable apparatus for the two larger cylinders. The 7-inch cylinder affords a spark of $10\frac{1}{2}$ inches at best. The 9-inch cylinder, not having its conductor insulated on a support sufficiently high, afforded flashes to the table which was 14 inches distant. And the 12-inch cylinder, being mounted only as a model or trial for constructing a larger apparatus, is defective in several respects which I have not thought fit to alter. When the five-inch ball gives flashes, the cylinder is enveloped on all sides with fire which rushes from the receiving part of the conductor.

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172 Surprising appearance on raising an electrical kite. * Memoirs of the American Academy, Vol. I. p. 257.

170 Effects of different cylinders on the human body.

*Fig. 90.**Fig. 88. Fig. 86.**Fig. 92.**Fig. 91.**Fig. 89.**Fig. 87.**Atoll. Prin. Wal. Sculptor. fecit.*

Miscellaneous Experiments. I never use points, but in a simple machine bring the conductor almost in contact with the cylinder. In this apparatus that cushion to which the rubber is not applied serves that purpose.

173. Jas. charged by them. "24. These marks exhibit the intensity as deduced from simple electrifying. I will now mention the rate of charging, which was nearly the same in all the three cylinders.

173. Mr. Nicholson's machines superior to Van Marum's. "A large jar of 350 square inches, or near $2\frac{1}{2}$ square feet, with an uncoated varnished rim of more than four inches in height, was made to explode spontaneously over the rim. The jar, when broken, proved to be 0.082 inches thick on an average; and the number of square feet of the surface of the cylinder which was rubbed to produce the charge of one foot, was, when least, 18.03, and when moist, with good excitation, 19.34. The great machine at Haarlem charges a single jar of one foot square by the friction of 66.6 square feet, and charges its battery of 225 square feet at the rate of 94.8 square feet rubbed for each foot. The intensity of electricity on the surface of the glass is therefore considerably less than $\frac{1}{4}$ th of that here spoken of; but if we take the most favourable number 66.6 at the commencement of turning, and halve it on account of the unavoidable imperfection of a plate machine (as shown in par. 14.), it will be found, that the management applied to that machine would cause a cylinder to charge one square foot by the friction of $33\frac{1}{2}$ square feet. It must be observed, however, that M. Van Marum's own machine, consisting of two plates 33 inches diameter, has only half the intensity, though he reckons it a very good one. This machine is about equal in absolute power to my 9-inch cylinder, with its short rubber; but it is near 30 times as dear in price. In all these deductions I omit the computations, for the sake of brevity, and because they are easily made. The data are found in the description of the Teylerian machine, and its continuation published at Haarlem in the years 1785 and 1787.

174. Gradual improvements in excitation. "I shall here take the liberty of observing, that the action of the cylinder, by a simple cushion or the hand, which excited the astonishment of all Europe, in the memory of our contemporaries, was first improved by the addition of a leathern flap; then by moistening the rubber; afterwards by applying the amalgam; and, lastly, by the addition of a silk flap. Now I find by experiment, that we at present obtain upwards of 40 times the intensity which the bare hand produces; and consequently, that, since 18 times our present intensity will equal the utmost we can now condense on strong glass even in the form of a charge, we have a less step to take before we arrive at that amazing power than our immediate predecessors have already made. My 9-inch cylinder, when broken, proved to be $\frac{1}{16}$ of an inch thick.

175. Difference in the appearance of positive and negative sparks. "25. Some of the luminous appearances with balls in the positive state, have been slightly noticed as criterions of intensity. I shall here add, that the escape of negative electricity from a ball is attended with the appearance of straight sharp sparks with a hoarse chirping noise. When the ball was less than two inches in diameter, it was usually covered with short flames of this kind, which were very numerous.

"26. When two equal balls were presented to each other, and one of them was rendered strongly positive,

Miscellaneous Experiments. while the other remained in connection with the earth, the positive brush or ramified spark was seen to pass from the electrified ball: when the other ball was electrified negatively, and the ball, which before had been positive, was connected with the ground, the electricity (passing the same way according to Franklin) exhibited the negative flame, or dense, straight, and more luminous spark, from the negative ball; and when the one ball was electrified plus and the other minus, the signs of both electricities appeared. If the interval was not too great, the long zig-zag spark of the plus ball struck the straight flame of the minus ball, usually at the distance of about $\frac{1}{4}$ d of the length of the latter from its point, rendering the other $\frac{3}{4}$ s very bright. Sometimes, however, the positive spark struck the ball at a distance from the negative flame. These effects are represented in Plate CLXXVIII. fig. 86, 87, 88.

"27. Two conductors of three-quarters of an inch diameter, with spherical ends of the same diameter, were laid parallel to each other, at the distance of about two inches, in such a manner as that the ends pointed in opposite directions, and were six or eight inches asunder. These, which may be distinguished by the letters *P* and *M*, were successively electrified as the balls were in the last paragraph. When one conductor *P* was positive, fig. 90, it exhibited the spark of that electricity at its extremity, and struck the side of the other conductor *M*. When the last mentioned conductor *M* was electrified negatively, fig. 89, the former being in its turn connected with the earth, the sparks ceased to strike as before, and the extremity of the electrified conductor *M* exhibited negative signs, and struck the side of the other conductor. And when one conductor was electrified *plus* and the other *minus*, fig. 91, both signs appeared at the same time, and continual streams of electricity passed between the extremities of each conductor to the side of the other conductor opposed to it. In each of these three cases, the current of electricity, on the hypothesis of a single fluid, passed the same way.

176. "28. In drawing the long spark from a ball of four inches diameter, I found it of some consequence, that the disposition of the stem should not be too short, because the vicinity of the large prime conductor altered the disposition of the electricity to escape: I therefore made a set of experiments, the result of which showed, that the disposition of balls to receive or emit electricity is greatly affected when they stand remote from other surfaces in the same state; and that between this greatest disposition in any ball; whatever may be its diameter, every possible less degree may be obtained by withdrawing the ball towards the broader or less convex surface out of which its stem projects, until at length the ball, being wholly depressed beneath that surface, loses the disposition entirely. From these experiments it follows, that a variety of balls is unnecessary in electricity; because any small ball, if near the prime conductor, will be equivalent to a larger ball whose stem is longer.

177. "29. From comparing some experiments made by myself many years ago with the present set, I considered a point as a ball of an indefinitely small diameter, and constructed an instrument consisting of a brass ball of six inches diameter, through the axis of which a stem, carrying a fine point, was screwed. When this stem

stem is fixed in the prime conductor, if the ball be moved on its axis in either direction, it causes the fine point either to protrude through a small hole in its external surface, or to withdraw itself; because by this means the ball runs along the stem. The disposition of the point to transmit electricity may thus be made equal to that of any ball whatever, from the minutest size to the diameter of six inches. See fig. 32. *A*.

"30. The action of pointed bodies has been a subject of discussion ever since it was first discovered, and is not yet well explained. To those who ascribe this effect to the figure of electric atmospheres, and their disposition to fly off, it may be answered, that they ought first to prove their existence, and then show why the cause which accumulated them does not prevent their escape; not to mention the difficulty of explaining the nature of negative atmospheres. If these be supposed to consist of electrified air, it will not be easy to show why a current of air passing near a prime conductor does not destroy its effects. The opinion supported by the celebrated Volta and others, that a point is the coating to an infinitely small plate of air, does not appear better founded: for such a plate must be broken through at a greater distance only because higher charged; whence it would follow, that points should not act but at high intensities. I must likewise take notice, as a proof that the charge has little to do here, that if a ball be presented to the prime conductor, at the same time that a point proceeds from the opposite side of the ball, the electricity will pass by the point, though it is obliged to go round the ball for that purpose; but it can hardly be doubted, that whatever charge obtains in this case is on the surface of the ball next the conductor, and not on the remote side to which the electricity directs its course.

"31. The pointed apparatus described (par. 29.) shows that the effect of points depends on the remoteness of their extremities from the other parts of the conductor. This leads to the following general law: *In any electrified conductor, the transition or escape of electricity will be made chiefly from that part of the surface which is the most remote from the natural state.* Thus in the apparatus of the ball and stem, the point having a communication with the rest of the whole conductor, constantly possesses the same intensity; but the influence of the surrounding surface of the ball diminishes its capacity. This diminution is less the farther the ball is withdrawn, and consequently the point will really possess more electricity, and be more disposed to give it out when it is prominent than when depressed. The same explanation serves for negative electricity.

"32. The effect of a positive surface appears to extend farther than that of a negative: for the point acts like a ball when considerably more prominent if it be positive than it will if negative.

"For the sake of conciseness, I pass over many facts which have presented themselves in the course of my experiments on the two electricities, and content myself with observing, that there is scarcely any experiment made with the positive power, which will not afford a result worthy of notice, if repeated with the negative."

With regard to the direction of the electric fluid, we shall only farther take notice of two experiments,

N^o 113.

which have been thought to prove directly the passage of the fluid outward from the positive and inward to the negative side of the phial. Fig. 18. represents an electric jar, whose exterior coating is made up of small pieces of tin-foil placed at a small distance from each other. This jar is to be charged in the usual manner, when small sparks of the electric fluid will pass from one piece of tin-foil to the other, in various directions, forming a very pleasing spectacle. The separation of the tin-foil is the cause of this visible passage of the fluid from the outside to the table; and the experiment is similar in appearance to that of the spiral tube mentioned in the foregoing section. If the jar be discharged by bringing a pointed wire gradually to the knob *I*, the unsealed part of the glass between the wire and knob will be agreeably illuminated with a crackling noise of the sparks. If the jar be suddenly discharged, the whole outside will be illuminated. The jar, in this experiment, must be very dry when used.

Fig. 19. represents two jars, or Leyden phials, placed one over the other, by which various experiments may be made in order to elucidate the common theory. Bring the outside coating of the bottle *A* in contact with the prime conductor, and turn the machine till the bottle is charged; then place one ball of the discharging rod upon the coating of *B*, and with the other touch the knob of the jar *A*, which will cause an explosion; now place one ball of the discharger on the knob *A*, and bring the other ball to its coating, and you have a second discharge. Again, apply one ball of the discharger to the coating of *B*, and carry the other to the coating of *A*, and it will produce a third discharge. A fourth is obtained by applying the discharger from the coating of *A* to its knob. The outer coating of the under jar communicating with the inside of the under one, conveys the fluid from the conductor to the large jar, which is therefore charged positively: the upper jar does not charge, because the inside cannot part with any of its electric fluid; but when a communication is formed from the outside of *A* to the inside of *B*, part of the fire on the inside of *A* will be conveyed to the negative coating of *B*, and the jar will be discharged. The second explosion is occasioned by the discharge of the jar *A*; but as the outside of this communicates, by conducting substances, with the positive inside of the jar *B*, if the ball of the discharging rod remains for a little time after the discharge on the knob of *A*, part of the fire of the inside of *A* will escape, and be replaced by an equal quantity on the outside from the jar *B*, by which means *A* is charged a second time; the discharge of this produces the third, and of *B* the fourth explosion.

Fig. 20. is an electric jar, which serves to illustrate the contrary states of the side of a Leyden phial while charging. *BB* is the tin-foil coating; *C* a stand which supports the jar; *D* a socket of metal, carrying the glass rod *E*, a bent brass wire pointed at each end, and fixed at the end of the rod *G*; which rod is moveable in the spring tube *N* at pleasure: that tube being fixed by a socket on the top of the glass rod *E*, the jar is charged by the inside wire, which communicates with the different divisions of the inside coating by horizontal wires.

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Place

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Plate CLXXIV.
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Construction of jars to show the course of the electric fluid.

Experiments on the various kinds of air with Dr Van Marum's great electrical machine.

Place the jar to the conductor as usual; and, when charging, a luminous speck will appear upon the upper point of the wire at *P*, clearly showing, according to the commonly received opinion, that the point is then receiving the electric fluid. From the upper ring of coating *B*, on the outside of the jar, a fine stream or pencil of rays will at the same time fly off, beautifully diverging from the lower point of the wire *F* upon the bottom ring of the coating of the jar. When the appearances cease, which they do when the jar is charged, let a pointed wire be presented towards the conductor: this will soon discharge the jar silently; during which the point will be illuminated with a small spark, while the upper point of the wire will throw off a pencil of rays diverging towards the upper ring of the coating.

We shall conclude this section with an account of some effects of the electrical fluid upon various elastic vapours. These were tried to the greatest advantage by Dr Van Marum with the great machine already mentioned: and for this purpose he used a cylindrical glass receiver five inches long and an inch and a quarter in diameter, into which different sorts of elastic fluids were successively inserted, and were confined by quicksilver or water. To a hole made in the bottom of the inverted glass receiver an iron wire was fastened, the external part of which communicated with a conductor, which being presented to the prime conductor of the machine, received the sparks from it. In this disposition of the apparatus it evidently appears, that the sparks passed through the elastic fluid contained in the receiver, by going from the inner extremity of the wire to the quicksilver or water in which the receiver was inverted. With this apparatus it was found, that dephlogisticated air, obtained from mercurial red precipitate, lost $\frac{1}{10}$ th of its bulk; but its quality was not sensibly altered, as it appeared from examining it with the eudiometer. This experiment being repeated when the receiver was inverted in lime-water, and likewise in the infusion of turnsole, there ensued no precipitation, no change of colour, nor any phlogistication of the air. On pouring out this air, the usual smell of the electric fluid was perceived very sensibly.

Nitrous air was diminished of more than the half of its original bulk; and in that diminished state, being mixed with common air, it occasioned no red colour, nor any sensible diminution. It had lost its usual smell, and it extinguished a candle. In passing the sparks through the nitrous air, a powder is formed on the surface of the quicksilver, which is a part of that metallic substance dissolved by the nitrous acid.

Inflammable air, obtained from iron and diluted vitriolic acid, communicated a little redness to the tincture of turnsole. The stream of electric fluid through this air appeared more red, and much larger, than in common air, being every where surrounded by a faint blue light.

The inflammable air, obtained from spirit of wine and vitriolic acid, was increased to about three times its original bulk, and lost a little of its inflammability.

Fixed air from chalk and vitriolic acid, was a little increased in bulk by the action of electricity; but it was rendered less absorbable by water.

Vitriolic acid air, obtained from vitriolic acid and M. Scheele's charcoal, was diminished a little, and black spots were formed on the inside of the glass receiver. Afterwards it was observed, that only one-eighth part of the electrified elastic fluid was absorbed by water. It extinguished a candle, and had very little smell.

Marine acid air seemed to oppose in great measure the passage of the electric fluid; since the sparks would not pass through a greater length than 2½ inches of this air. It was considerably diminished, but the rest was readily absorbed by water.

Spathous air was neither diminished, nor any other way sensibly altered, by the electric sparks.

Alkaline air, extracted from spirit of sal ammoniac, was at first almost doubled in bulk; then it was diminished a little; after which it remained without any augmentation or diminution. It became unabsorbable by water, and by the contact of flame it exploded, like a mixture of inflammable air and a good deal of common air.

Common air was lastly tried, and it was found to give a little faint redness to the tincture of turnsole; becoming at the same time sensibly phlogisticated. The experiment was repeated thrice at different times, and in each time after the electrization it was examined by the admixture of nitrous air in Mr Fontana's eudiometer, and it was compared with the same air not electrified; the latter always suffering the greatest diminution. In the first experiment the diminutions were $\frac{1}{10}$ th and $\frac{1}{10}$ th; in the second, $\frac{1}{10}$ th and $\frac{1}{10}$ th; and in the last, $\frac{1}{10}$ th and $\frac{1}{10}$ th.

On attempting to repeat Mr Cavendish's experiment,* in which he produced the nitrous acid by a mixture of pure with phlogisticated air; instead of a syphon, the Doctor made use of a glass tube $\frac{1}{10}$ th part of an inch in diameter, closed at one end, into which an iron wire, $\frac{1}{10}$ th of an inch in diameter, had been inserted: into this tube, filled with mercury, and fixed in a vertical position, was introduced the air with which the experiment was to be tried. The dephlogisticated air was obtained from red precipitate, and had been thoroughly purified by alkaline salts, from any acid it might have contained. With a mixture of 5 parts of this and 3 of common air, the tube was filled to the height of 3 inches, to which was added $\frac{1}{10}$ th of an inch of lixivium, of the same kind with that used by Mr Cavendish. The result was, that, after transmitting through the tube a continued stream of the electrical fluid during 15 minutes, 2 inches of the air were absorbed by the lixivium: more air being introduced into the tube till it was filled to the height of 3 inches, when it was again electrified. This process was repeated till 8½ inches of air had been absorbed by the lixivium: this was now examined, and found to be, in some degree, impregnated with the nitrous acid; but it was very far from being saturated. With the same lixivium, of which a quarter of an inch remained in the tube, the experiment was continued till 14 inches more of air had been absorbed; but its diminution was not perceived to decrease, though the lixivium had now absorbed 77 measures of air, each equal to its own; whereas, in the experiment related by Mr Cavendish, only 38 measures of air were absorbed by the alkali. But notwithstanding this

greater absorption, the lixivium was yet far from being saturated.

The experiment was repeated with pure air, produced by minium, moistened with the vitriolic acid, and deprived of its fixed air; seven parts of this were mixed with three of phlogisticated air, and lixivium added to the height of $\frac{1}{4}$ th of an inch. Here, as in the former experiment, the diminution continued without any decrease; and the lixivium, after it had absorbed $22\frac{1}{4}$ th inches, and consequently 178 times its own measure of air, was very far from being saturated with the nitrous acid.

On this Dr Van Marum wrote to Mr Cavendish; and finding, by his answer, that this gentleman had used pure air, obtained from a black powder produced by shaking mercury with lead, he requested to be informed of the process by which it is generated: but Mr Cavendish, not choosing to communicate this at present, he determined to defer the repetition of the experiment till this ingenious philosopher shall have published his mode of obtaining the pure air used in it.

Our author then goes on to some experiments made by suffering the electric fluid to pass in a continued stream through various kinds of air, inclosed for this purpose in the little glass tube used in the last experiments.

Pure air obtained the week before from red precipitate, being placed over mercury, and electrified for 30 minutes, was diminished by $\frac{1}{4}$ th, the surface of the quicksilver soon began to be calcined, and towards the end of the experiment the glass tube was so lined with the calx as to cease to be transparent. By introducing a piece of iron, the electric stream was made to pass through the air without immediately touching the mercury; yet this was equally calcined. This phenomenon the Doctor ascribes solely to the dissolution of the pure air, the principle of which unites itself with the metal; as in these experiments the mercury had not acquired any sensible heat. Two inches and 3 quarters of the same kind of air being placed over water, and electrified in the same manner during half an hour, lost a quarter of an inch; and being suffered to stand 12 hours in the tube, was found to have lost $\frac{1}{4}$ th of an inch more. This was very nearly the same diminution of the air that had taken place when it was electrified over mercury; but, in this case, the process appears to be more slow, and the detached principle not so readily absorbed. The air remaining after these experiments, being tried by the eudiometer, did not differ from unelectrified pure air taken from the same receiver.

To determine whether the pure air retained any of the acid employed in its production, the Doctor repeated the experiment with air obtained from red precipitate, confined by an infusion of turnsole, but could not perceive in it the least change of colour. He also electrified air obtained from minium and the vitriolic acid, placed over some diluted vinegar of lead; but this was not rendered at all turbid.

Three inches of phlogisticated air being electrified, during the first 5 minutes were augmented to $3\frac{1}{2}$ th inches, and in the next 10 minutes to $3\frac{3}{4}$ th inches; some lixivium was then introduced to try whether this

would absorb it; but upon being electrified 15 minutes, the column rose to the height of $3\frac{1}{4}$ th inches. It was suffered to stand in the tube till the next day, when it was found to have sunk to its original dimensions.

Nitrous air, confined by lixivium, being electrified during half an hour, lost 3 quarters of its bulk; the lixivium appeared to have absorbed a great deal of nitrous acid; and the air remaining in the tube did not seem to differ from common phlogisticated air. Some of the same nitrous air, confined by lixivium, was, by standing 3 weeks, diminished to half its bulk, and this residuum also proved to be phlogisticated air. Thus electricity very speedily effects that separation of the nitrous acid from nitrous air, which is slowly produced by the lixivium alone.

Inflammable air obtained from steel-s filings and the diluted vitriolic acid, being confined by an infusion of turnsole, was electrified for 10 minutes without any change of colour in the infusion, or any alteration in the bulk of the air. The tube being filled with the same air to the height of $2\frac{1}{4}$ inches, and placed in diluted vinegar of lead, was exposed to the electric stream during 12 minutes, in which time the inclosed air rose to 5 inches; but the vinegar remained perfectly clear. Three inches of inflammable air obtained from a mixture of spirits of wine with oil of vitriol, on being electrified for 15 minutes, rose to 10 inches; thus dilated, it lost all its inflammability, and when nitrous air was added, no diminution ensued.

A column of alkaline air obtained by heat from spirit of sal ammoniac, 3 inches high, was electrified 4 minutes, and rose to 6 inches, but did not rise higher when electrified 10 minutes longer. It appears that this air is not expanded more by the powerful electric stream from this machine than by the common spark. Water would not absorb this electrified air, which was in part inflammable.

The tube, being filled to the height of an inch with spirit of sal ammoniac, and inverted in mercury, was electrified 4 minutes; in which time the tube was filled with 8 inches of air, which proved to be equally inflammable, and as little absorbed by water as the alkaline air. Hence Dr Van Marum conjectures that this air is only the volatile alkali rendered elastic.

The following experiment is very curious, and may serve to illustrate some phenomena observed in thunderstorms. Two balloons, made of the allantoides of a calf, were filled with inflammable air, of which each contained about 2 cubic feet. To each of these was suspended, by a silk thread about 8 feet long, such a weight as was just sufficient to prevent it from rising higher in the air; they were connected, the one with the positive, the other with the negative conductor, by small wires about 30 feet in length, and being kept near 20 feet asunder, were placed as far from the machine as the length of the wires would admit. On being electrified, these balloons rose up in the air as high as the wire allowed, attracted each other, and uniting as it were into one cloud, gently descended. The rising of these artificial clouds is ascribed to the expansion of the air they contained, in consequence of the repulsive force communicated to its particles by elec-

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Curious experiment with balloons filled with inflammable air.

Miscellaneous Experiments.

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electricity : when in contact, their opposite electrical powers destroyed each other, and they recovered their specific gravity by losing the cause of its diminution. In order to render this experiment more perfectly imitative, the Doctor suspended to the balloon which was connected with the negative conductor, a bladder filled with a mixture of inflammable and atmospheric air, which, being kindled by the spark that took place on the union of these clouds, gave a considerable explosion. From these experiments, the Doctor explains the sudden elevation of the clouds, and the violent showers of rain and hail, which often accompany thunder-storms.

Dr Priestley's experiments on the effects of the electric fluid on air.

In the course of his experiments upon air and electric fluid, Dr Priestley found, that, by means of the spark, he was able to turn vegetable blues to a red colour; though we are not to imagine that this was any indication of the acidity of the electric fluid, but merely of the decomposition of the air, and its conversion into fixed air or aerial acid. The instrument used in this experiment is a glass tube about 4 or 5 inches long and $\frac{1}{8}$ or $\frac{1}{10}$ ths of an inch diameter in the inside; a piece of wire is put into one end of the tube, and fixed there with cement; a brass ball is placed on the top of this wire; the lower part of the tube is to be filled with water, tinged blue with a piece of turnsole or archil. This is easily effected, by setting the tube in a vessel of the tinged water, then placing it under a receiver on the plate of the air-pump; exhaust the receiver in part, and then, on letting in the air, the tinged liquor will rise in the tube, and the elevation will be in proportion to the accuracy of the vacuum; now take the tube and vessel from under the receiver, and throw strong sparks on the brass ball from the prime conductor.

When Dr Priestley made this experiment, he perceived, that after the electric spark had been taken between the wire and the liquor about a minute, the upper part of it began to look red; in 2 minutes it was manifestly so, and the red part did not readily mix with the liquor. If the tube was inclined when the sparks were taken, the redness extended twice as far on the lower side as on the upper. In proportion as the liquor became red, it advanced nearer to the wire, so that the air in which the sparks were taken was diminished; the diameter amounted to about $\frac{1}{4}$ th of the whole space; after which, a continuance of the electrification produced no sensible effect.

To determine whether the cause of the change of colour was in the air or in the electric matter, Dr Priestley expanded the air in the tube by means of an air-pump, till it expelled all the liquor, and admitted fresh blue liquor in its place: but after this, electricity produced no sensible effect on the air or on the liquor; so that it was clear, that the electric matter had decomposed the air, and made it deposit something of an acid nature. The result was the same with wires of different metals. It was also the same when, by means of a bent tube, the spark was made to pass from the liquor in one leg to the liquor in the other. The air thus diminished was in the highest degree noxious.

In passing the electric spark through different elastic fluids, it appears of different colours. In fixed air, the spark is very white; in inflammable and

alkaline air, it appears of a purple or red colour. From hence we may infer, that the conducting power of these airs is different, and that fixed air is a more perfect non-conductor than inflammable air.

The spark was not visible in air from a caustic alkali made by M. Lane, nor in air from spirit of salt; so that they seem to be more perfect conductors of electricity than water or other fluid substances.

The electric spark, taken in any kind of oil, produces inflammable air. Dr Priestley tried it with ether, oil of olives, oil of turpentine, and essential oil of mint, taking the electric spark in them without any air to begin with; inflammable air was produced in them all.

Dr Priestley found, that on taking a small electric explosion for an hour, in the space of an inch of fixed air, confined in a glass tube $\frac{1}{8}$ th of an inch diameter, when water was admitted to it, only $\frac{1}{4}$ th of the air was imbibed. Probably the whole would have been rendered immissible in water, if the electrical operation had been continued a sufficient time.

The electric spark, when taken in alkaline air, appears of a red colour; the electric explosions, which pass through this air, increase its bulk; so that, by making about 200 explosions in a quantity of it, the original quantity will be sometimes increased $\frac{1}{4}$ th. If water is admitted to this air, it will absorb the original quantity, and leave about as much elastic fluid as was generated by the electricity, and this elastic fluid is a strong inflammable air.

Dr Priestley found, when the electric spark was taken in vitriolic acid air, that the inside of the tube in which it was confined was covered with a blackish substance. He seems to think, that the whole of the vitriolic acid air is convertible into this black matter, not by means of any union which it forms with the electric fluid, but in consequence of the concussion given to it by the explosion; and that, if it be the calx of the metal which supplied the phlogiston, it is not to be distinguished from what metal, or indeed from what substance of any kind, the air had been extracted.

Dr Priestley made 150 explosions of a common jar in about a quarter of an ounce measure of vitriolic acid air from copper, by which the bulk was diminished about $\frac{1}{2}$, and the remainder seemingly not changed, being all absorbed by water. In the course of this process, the air was carefully transferred three times from one vessel to another; and the last vessel, in which the explosions were made, was, to all appearance, as black as the first; so that the air seems to be all convertible into this black substance.

Thinking this diminution of the vitriolic acid air might arise from its absorption by the cement with which the glass tubes employed in the last experiment were cloied, he repeated it with the air from quicksilver, in a glass syphon confined by quicksilver, and the result was the same.

That this matter comes from the vitriolic acid air only, and not from any combination of the electric matter with it, will appear from the following experiment.

He took the simple electric spark from a conductor of a moderate size, for the space of 5 minutes without interruption, in a quantity of vitriolic acid

air, without producing any change in the inside of the glass; when immediately after, making in it only two explosions of a common jar, each of which might be produced in less than a quarter of a minute with the same machine in the same state, the whole of the inside of the tube was completely covered with the black matter. Now, had the electric matter formed any union with the air, and this black matter had been the result of that combination, all the difference that would have arisen from the simple spark or the explosion, could only have been a more gradual or a more sudden formation of that matter.

A large phial, about an inch and a half wide, being filled with this air, the explosion of a very large jar, containing more than 2 feet of coated surface, had no effect upon it; from which it should seem, that in these cases the force of the shock was not able to give the quantity of air such a concussion as was necessary to decompose any part of it.

He had generally made use of copper, but afterwards he procured this air from almost every substance from which it could be obtained; the electric explosion taken in it produced the same effect. But as some of the experiments were attended with peculiar circumstances, he briefly mentions them as follows.

When he endeavoured to get vitriolic acid air from lead, putting a quantity of leaden shot into a phial containing oil of vitriol, and applying only the usual degree of heat, a considerable quantity of heat was produced; but afterwards, though the heat was increased till the acid boiled, no more air could be got. He imagined, therefore, that in this case the phlogiston had in fact been supplied by something that had adhered to the shot. However, in the air so produced, he took the electric explosion; and in the first quantity he tried, a whitish matter was produced, almost covering the inside of the tube; but in the succeeding experiments, with air produced from the same shot or from something adhering to it, there was less of the whitish matter; and at last nothing but black matter was produced, as in all the other experiments. Water being admitted to this air, there remained a considerable residuum, which was very slightly inflammable.

Vitriolic acid air is easily procured from spirit of wine, the mixture becoming black before any air is yielded. The electric explosion taken in this air also produced the black matter.

The experiments made with ether seem to throw most light upon this subject, as this air is as easily procured from ether as any other substance containing phlogiston. In the air procured by ether the electric explosion tinged the glass very black, more so than in any other experiment of the kind; and when water had absorbed what it could of this air, there was a residuum in which a candle burned with a lambent blue flame. But what was most remarkable in this experiment was, that besides the oil of vitriol becoming very black during the process, a black substance, and of a thick consistence, was formed, which swam on the surface of the acid.

It is very possible, that the analysis of this substance may be a means of throwing light upon the nature of the black matter formed by electric explosions

in vitriolic acid air, as they seem to resemble one another very much.

The electric spark or explosion taken in common air, confined by quicksilver in a glass tube, covers the inside of the tube with a black matter, which, when heated, appears to be pure quicksilver. This, therefore, may be the case with the black matter into which he supposed the vitriolic acid air to be converted by the same process, though the effect was much more remarkable than in the common air. The explosion will often produce the diminution of common air in half the time that simple sparks will do it, the machine giving the same quantity of fire in the same time: also, the blackness of the tube is much sooner produced by the shocks than by the sparks. When the tube considerably exceeds $\frac{1}{2}$ of an inch in diameter, it will sometimes become very black, without any sensible diminution of the quantity of air.

SECT. X. *Of the Methods of measuring Electricity both artificial and natural; of condensing and doubling it, so that the smallest Quantity may be made perceptible; of distinguishing the two Kinds of Electricity from one another, &c.*

We have already had occasion to mention, and in part to explain, the instruments for this purpose named *electrometers*. When the electricity is very evident, many obvious contrivances may be fallen upon to determine its quality and strength, when compared with that of any other body electrified also to a considerable degree. But in many cases the quantity of electricity is so small that it does not discover itself by any of the ordinary electrometers; and in others, though the quantity be very great, yet we are destitute of any proper standard which might enable us to compare it with another of apparently the same height, or which might determine the degrees of charge which the electrified substance progressively receives.

In the former case, Dr Priestley recommends a single thread of silk as it comes from the worm; which being extremely light and flexible, very readily discovers the electric properties of any body, by being first attracted and then repelled by it; and, as this substance at the same time has a power of retaining its electricity very strongly, we have thus an opportunity of determining whether the body from which it received the electricity was positive or negative. Even this electrometer has not been found to be endowed with all the sensibility to be wished for; so that others have been contrived which answer to a still greater degree of exactness. For ordinary purposes the following instruments are most commonly made use of.

Fig. 13. represents a stand supporting the electrometers *DD*, *CC*. *B* is the basis of it, made of common wood. *A* is a pillar of wax, glass, or baked wood. To the top of the pillar, if it be of wax or glass, a circular piece of wood is fixed; but if the pillar be of baked wood, that may constitute the whole. From this circular piece of wood proceed four arms of glass, or baked wood, suspending at their ends four electrometers, two of which *DD* are silk threads about eight inches long, suspending each a small downy feather

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Description of various
of the electro-
meters.

Plate
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Methods of feather at its end. The other two electrometers *CC* are those with very small balls of cork, or of the pith of alder; and they are constructed in the following manner. *ab* is a stick of glass about six inches long, covered with sealing wax, and shaped at top in a ring; from the lower extremity of this stick proceed two fine linen threads (*κ*) *cc* about five inches long, each suspending a cork or pith-ball *d* about $\frac{1}{4}$ th of an inch in diameter. When this electrometer is not electrified, the threads *cc* hang parallel to each other, and the cork-balls are in contact; but when electrified, they repel one another, as represented in the figure. When it happens to be inconvenient to use the insulating stand *AB*, the electrometers may be easily supported by a glass rod or tube.

Another species of the above electrometer is represented in fig. 14. which consists of a linen thread, having at each end a small cork-ball. This electrometer is suspended by the middle of the thread on any conductor proper for the purpose, and serves to show the kind and quantity of its electricity.

Fig. 15. represents Mr Henly's quadrant electrometer fixed upon a small stand, from which it may be occasionally separated and fixed upon the prime conductor, or in any other place, at pleasure. This electrometer consists of a perpendicular stem formed at the top like a ball, and furnished at its lower end with a brass ferule, by which it may be fixed in one of the holes of the prime conductor, or in its proper stand, as occasion requires. To the upper part of the stem or pillar, a graduated ivory femicircle is fixed; about the middle of which is a brass arm, which contains a pin, or the small axis of the index. The index consists of a very slender stick, which reaches from the centre of the graduated femicircle to the brass ferule, and at its lower extremity is fastened a small cork-ball, nicely turned in a lathe.

When this electrometer is not electrified, the index hangs parallel to the pillar; but when it is electrified, the index recedes more or less, according to the quantity of electricity from the stem. See *F G D I*, in fig. 14. and *ab* in fig. 6. both of which are new and improved ways of applying it; by which the quantity of the shocks are regulated in the most convenient manner, as will be more particularly explained under *Medical Electricity*, SECT. XII.

Fig 16. and 17. represent an electrometer nearly similar to that contrived by Mr Brooke. The two instruments are sometimes combined in one, or used separately, as in these figures. The arms *F H f k*, fig. 17. when in use, are to be placed as much as possible out of the atmosphere of a jar, battery, prime conductor, &c. The arm *F H* and the ball *K* are made of copper, and as light as possible. The divisions on the arm *F H* are each of them exactly a grain. They are ascertained at first by placing grain weights on a brass ball which is within the ball *L* (this ball is an exact counterbalance to the arm *F H* and the ball *K* when the small slide on this arm is at the first division); and then removing the slide till it, together with the ball *K*, counterbalances the ball *L* and the weight laid on it.

A, fig. 16. is a dial-plate, divided into 90 equal parts.

The index of this plate is carried once round, when the arm *BC* has moved through 90 degrees, or a quarter of a circle. That motion is given to the index by the repulsive power of the charge acting between the ball *D* and the ball *B*.*

The arm *BC* being repelled, shows when the charge is increasing, and the arm *F H* shows what this repulsive power is between two balls of this size in grains, according to the number the weight rests at when lifted up by the repulsive power of the charge: at the same time the arm *BC* points out the number of degrees to which the ball *B* is repelled; so that, by repeated trials, the number of degrees, answering to a given number of grains, may be ascertained, and a table formed from these experiments, by which means the electrometer, fig. 16. may be used without that of fig. 17.

Mr Brookes thinks, that no glass charged (as we call it) with electricity, will bear a greater force than that whose repulsive power, between two balls of the size he used, is equal to 60 grains; that in very few instances it will stand 60 grains weight; and he thinks it hazardous to go more than 45 grains.

Hence, by knowing the quantity of coated surface, and the diameter of the balls, we may be enabled to say, so much coated surface, with a repulsion between balls of so many grains, will melt a wire of such a size, or kill such an animal, &c.

Mr Brookes thinks, that he is not acquainted with all the advantages of this electrometer; but that it is clear, it speaks a language which may be universally understood, which no other will do; for though other electrometers will show whether a charge is greater or less, by an index being repelled to greater or smaller distances, or by the charge exploding at different distances, yet the power of the charge is by no means ascertained: but this electrometer shows the force of the repulsive power in grains; and the accuracy of the instrument is easily proved, by placing the weights on the internal ball, and seeing that they coincide with the divisions on the arm *F H*, when the slide is removed to them.

Mr Achard has shown clearly, that if the scale of an electrometer is divided into equal parts (degrees for example), the angle at which the index is held suspended by the electric repulsion will not be a true measure of the repulsive force; to estimate which truly, he demonstrates that the arc of the electrometer should be divided according to a scale of arcs, the tangents of which are in arithmetical progression.

The electrometer of which this is an imitation was invented by Mr Brookes, and described in his treatise already quoted. An account of it is given in that treatise, along with a very full representation of it by plates; but as these are somewhat difficult to be understood, we must for further particulars refer to the treatise itself. On this electrometer, however, we must observe, that it is constructed on the only true principle on which machines for measuring the quantity of electricity can be made. The mere attraction of any light body shows indeed that the substance which attracts it is electrified; but this property is by no means calculated to discover the comparative strength of it, on account

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Brookes's
electrometer.

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* Phil. Trans. vol. lxxxii. p. 384.

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count of its continual variation. Thus, if we hold any body within the electrified atmosphere of another, though it be first attracted pretty strongly, yet that attraction will be constantly diminishing, and at last changed into a repulsive power; but the latter, after it has once taken place, continues invariable as long as any degree of electric charge remains.

1784
Mr Caval-
li's atmo-
spherical e-
lectromete-
ter.

The electricity of the atmosphere particularly, has engaged the attention of philosophers; and by reason of its infinite variety, requires the most delicate instruments to observe its minutiae. Besides the kite formerly described, which was an invention of Dr Franklin's, Mr Cavallo has invented several others. Fig. 61. represents a portable atmospheric electrometer, the principal part of which is a glass tube *CDMN*, cemented at the bottom into the brass piece *AB*, by which part the instrument is to be held when used for the atmosphere; and it also serves to screw the instrument into its brass case *ABO*, fig. 69. The upper part of the tube *CDMN* is shaped tapering to a small extremity, which is entirely covered with sealing-wax; to this tapering part a small tube is cemented; the lower extremity, being also covered with sealing-wax, projects a small way within the tube *CDMN*; into this smaller tube a wire is cemented, which with its under extremity touches the flat piece of ivory *H*, fastened to the tube by means of a cork; the upper extremity of the wire projects about a quarter of an inch above the tube, and screws into the brass cap *EF*, which cap is open at the bottom, and serves to defend the waxed part of the instrument from the rain, &c.

IM and *KN* are two narrow slips of tin-foil, stuck to the inside of the glass *CDMN*, and communicating with the brass bottom *AB*. They serve to convey that electricity which, when the balls touch the glass, is communicated to it, and being accumulated, might disturb the free motion of the balls.

To use this instrument for artificial electricity, electricity the brass cap by an electrified substance, and the divergence or convergence of the balls of the electrometer, at the approach of an excited electric, will show the quality of the electricity. The best manner to electrify this instrument is, to bring excited wax so near the cap that one or both of the corks may touch the side of the bottle *CDMN*, after which they will soon collapse and appear un electrified. If now the wax is removed, they will again diverge, and remain electrified positively.

When this electrometer is to be used to try the electricity of the fogs, air, clouds, &c. the observer is to do nothing more than to unscrew it from its case, and hold it by the bottom *AB* to present it to the air a little above his head, so that he may conveniently see the ball *P*, which will immediately diverge if there is any electricity; i. e. whether positive or negative may be ascertained, by bringing an excited piece of sealing-wax or other electric towards the brass cap *EF*.

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M. Sauf-
ure's im-
provement
on this elec-
trometer

An improvement of Mr Cavallo's electrometer has been made by M. Sauffure. The principal circumstances in which they differ are, 1. The fine wires by which the balls are suspended, should not be long enough to reach the tin-foil which is pasted on the inside of the glass; because the electricity, when strong, will cause them to touch this tin-foil twice consecutively,

ly, and thus deprive them in a moment of their electricity. To prevent this defect, and yet give them a sufficient degree of motion, it is necessary to use larger glasses than those that are generally applied to Mr Cavallo's electrometer; two or three inches diameter will be found to answer the purpose very well. But as it is necessary to carry off the electricity which may be communicated to the inside of the glass, and thus be confounded with that which belongs to those substances that are under examination; four pieces of tin-foil should be pasted on the inside of the glass; the balls should not be more than $\frac{1}{10}$ th of an inch diameter, suspended by silver wire, moving freely in holes nicely rounded. The bottom of the electrometer should be of metal; for this renders it more easy to deprive them of any acquired electricity, by touching the bottom and top at the same time.

This electrometer may be used instead of the condenser of M. Volta, by only placing it on a piece of oiled silk, somewhat larger than the base of the instrument: but in this case it is the base and not the top of the instrument, which must be brought into contact with the substance whose electricity is to be explored.

By this instrument, it is easy to ascertain the degree of conducting power in any substance. For example, if it is placed on an imperfect conductor, as dry wood or marble, and if the instrument is electrified strongly, and afterwards the top is touched, the electricity will appear to be destroyed; but on lifting up the instrument by the top, the balls will again open, because the imperfect conductor formed with the base a kind of electrophorus, by which the electric fluid was condensed, and lost its tension, till the perfect conductor was separated from the imperfect one; whereas, if the conductor had been more perfect, it would have been deprived of its electricity immediately on the application of the hand.

It is easy to discover also, by this instrument, the electricity of any substance, as of cloaths, hair of different animals, &c. For this purpose, it must be held by the base, and the substance rubbed briskly (only once) by the ball of the electrometer; the kind of electricity may be ascertained in the usual manner. It is proper, however, to observe here, that as the top of the electrometer acts in this case as an insulated rubber, the electricity it acquires is always contrary to that of the rubbed body.

In order to collect a great quantity of electricity from the air, the electrometer is furnished with a point-collect wire 15 inches or two feet long, which unscrews in three or four pieces, to render the instrument more portable; see fig. 62. When it rains or snows, the small cover, fig. 63, is to be screwed on the top of the instrument, as by this its insulation is preserved, notwithstanding the rain.

This instrument indicates not only the electricity of fogs, but that also of serene weather, and enables us to discover the kind of electricity which reigns in the atmosphere; and to a certain degree to form an estimate of its quantity, and that under two different points of view, the degree of intensity, and the distance from the earth at which it first begins to be sensible.

A conductor exhibits signs of electricity only when the

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great quan-
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cal electri-

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Or to as-
certain the
kind of it.

Methods of the electric fluid is more or less condensed in the air than in the earth. Though the air resists the passage of the electric fluid, it is not absolutely impermeable to it; it suffers it to pass gradually, and generally with more ease in proportion as its mass or thickness is less.

It is therefore interesting to discover at what height it is necessary to be elevated, in order to find a sensible difference between the electricity of the earth and that of the air. A very sensible difference may be generally discovered by this instrument at the distance of four or five feet from the ground; sometimes it may be seen if the instrument is placed even on the ground, while at others it must be raised seven or more feet before the balls will open; sometimes, though seldom, this height is not sufficient. This distance is generally greatest when the electricity is strongest, though necessarily modified by a variety of circumstances, some of which are known, as the degree of dryness or humidity of the air, and others are unknown.

The degree of intensity, at a given height, may be discovered thus: raise the electrometer, and judge by the divisions which are placed on the edge thereof of the degree of their divergence. To find the relation between this degree of divergence and the force of the electricity, M. Saussure took the following method: As he could not with certainty double or triple a given quantity of electricity; yet as a given force may be reduced one half, a fourth, or eighth, &c. by dividing it between two equal and similar bodies, the electricity contained in one; he took two of his unarmed electrometers, which were as similar as possible, and electrified one of them, so that the balls separated precisely 6 lines: he then touched the top thereof by the top of that which was not electrified; in an instant the electricity was equally divided between them, as was evident by the divergence of the balls, which was 4 lines in each; consequently, a diminution of half the density had only lessened the divergence one third. One of these electrometers was then deprived of its electricity, and was afterwards brought in contact with the other, as before; the remaining electricity divided itself again between them, and the balls fell from 4 to 28 lines, nearly in the same proportion as before; in the third operation they fell to 19; in the fourth to one, where he was obliged to stop, as there was not now sufficient force in the fluid to pass from one electrometer to the other, and distribute itself uniformly between them. The same experiment repeated several times gave very nearly the same results. Negative e-

lectricity decreased also in the same proportion as the positive. The following table may therefore be considered as giving a general, though not exact, idea of the increase in force, which corresponds to different degrees of divergence in the balls; it is only calculated to every fourth of a line; the force of electricity is always expressed by whole numbers, as it would be ridiculous to put a greater degree of exactness in the numbers than is to be found in the experiments which form the basis of the calculation (1).

Distance of the balls
in fourths of a line.

Corresponding forces
of electricity.

1	—	—	1
2	—	—	2
3	—	—	3
4	—	—	4
5	—	—	5
6	—	—	6
7	—	—	8
8	—	—	10
9	—	—	12
10	—	—	14
11	—	—	17
12	—	—	20
13	—	—	23
14	—	—	26
15	—	—	29
16	—	—	32
17	—	—	36
18	—	—	40
19	—	—	44
20	—	—	48
21	—	—	52
22	—	—	56
23	—	—	60
24	—	—	64

Those who are desirous to carry this measure of the electric force further, may do it by having similar electrometers constructed, but made upon a larger scale, and with heavier balls, which would only separate one line, with the degree of electricity that makes the smaller ones diverge 6 lines; these would consequently measure a force 1024 times greater than that which forms the unity of the preceding table; and thus by degrees we may be enabled to discover the ratio of the strongest discharge of a great battery, or perhaps even of thunder itself, to that of a piece of amber, which only attracts a bit of straw or any other light substance. (M).

In

(1) M. Saussure, in a long note, anticipates the objections that may be made to the foregoing method of estimating the force of electricity; but as at the most they only show that this science is at present in a state of considerable imperfection, it will be unnecessary to take notice of them here.

(M) The consideration of the repulsive force is not sufficient to discover the absolute force of an explosion or electrical discharge: for M. Volta has shown, that the force of a discharge depends principally on the quantity of the electric fluid which passes from one body to another. Now the repulsive force of the electrometer only indicates the ratio of this quantity in equal and similar bodies, and which are also similarly situated. If equal quantities of the electric fluid were imparted to two unequal and separate conductors, the electric fluid being less condensed on the largest, would act with the least force on the electrometer; though it is probable, the force of the discharge in the two conductors would be equal. The repulsive force serves, however, to show what M. Volta calls the *electrical capacity* of a body, the quantity of the electric fluid it actually contains, or is capable of containing. To effect this, and have points of comparison, we should use light metallic balls, of different sizes, suspended by silk thread. One of these balls, unelectrified, being brought into contact with the

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render
the signs of
electricity
in the elec-
trometer
permanent.

In order to observe the electricity of the atmosphere with this instrument, we must first bring the electric fluid contained in the electrometer to the same degree of density with that at the surface of the earth; this is easily done by letting the bottom and top touch the ground at the same time; then raise the point, keeping the bottom still in contact with the ground, from whence it may be lifted up in a vertical position till the balls are level with the eye.

The second circumstance is to render the divergence of the balls, which is occasioned by the electricity of the air, permanent. This is effected by touching the top of the electrometer with the finger: but here the acquired electricity becomes contrary to that of the body by which they are electrified. Let us suppose, for example, that the electrometer is at five feet from the ground, and the balls diverging; touch the top of the electrometer with the finger, and the balls will close; but they will again open if the electrometer is withdrawn from the influence of the electricity of the air, by being brought nearer the ground, or into the house. M. Saussure only employed this method when the electricity was so weak that he could not perceive any until the electrometer was raised considerably above his eye: as in this case he could not perceive the divergence of the balls, he always endeavoured to obtain a permanent electricity in the foregoing manner.

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How to dis-
tinguish the
two electri-
cities.

To know whether the balls separate with positive or negative electricity, bring a piece of excited wax gradually near the top of the electrometer; if the balls separate further on the approach of the wax, they are negatively electrified, or of the same nature with the electricity of the wax; if on the other hand they come nearer together on the approach of the wax, then the electricity is positive, or in a contrary state to that of the wax. If glass is used, the results will be exactly the reverse of the preceding.

The following example will render the use of the foregoing observations more familiar. Choose an open situation free from trees and houses, screw the conductor on the top of the electrometer, lay hold of it by its base, and place it so that the base and conductor may touch the ground at the same time; then elevate it to the height of the eye, and observe the quantity of lines, or fourths of a line, that the balls have diverged; now lower it till the balls almost touch each other, and observe at what distance the top of the conductor is from the ground; and this is the height from the ground at which the electricity of the air begins to be sensible. If the electricity of the air is sufficiently strong to make the balls diverge when it

Nº 113.

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stands upon the ground, one of the lengths of the electrometer must be unscrewed from it. If the balls however still diverge, the other parts of the conductor should also be unscrewed, and you may mark down, that the electricity is sensible at zero, or on the surface of the earth. If, on the contrary, the electricity is so weak, as not to cause the balls to diverge when they are even with the eye, and consequently when the conductor is two feet higher, or seven feet from the ground, you should then raise it a foot higher; while it is thus elevated, touch the top with the other hand; when this hand is taken away, lower the electrometer, and if it is electrified you may say the electricity is sensible at eight feet; if it is not, raise it as high as the arm can reach, and repeat the same operation; if any electricity is found, write down electricity sensible at nine feet; if not, mark 0, or no electricity relative to this instrument, and this mode of employing it; for signs of electricity may still be obtained, by throwing a metallic ball 50 or 60 feet into the air, which is at the same time connected with the electrometer by a metallic thread.

One advantage of this instrument is, that it will often exhibit signs of electricity when none can be obtained from a conductor of 100 feet in height, because it can more easily be preserved from humidity, &c. which destroy the insulation of the large conductors.

Aerial electricity varies according to the situation; it is generally strongest in elevated and insulated situations, not to be observed under trees, in streets, in houses, or any inclosed places; though it is sometimes to be found pretty strong on quays and bridges. It is also not so much the absolute height of the places as their situation; thus a projecting angle of a high hill will often exhibit a stronger electricity than the plain at the top of the hill, as there are fewer points in the former to deprive the air of its electricity.

The intensity of the atmospheric electricity is varied by a great many circumstances, some of which may be easily accounted for, others with more difficulty. When the weather is not serene, it is impossible to assign any rule for their variation, as no regular correspondence can then be perceived with the different hours of the day, nor with the various modifications of the air. The reason is evident; when contrary and variable winds reign at different heights, when clouds are rolling over clouds, these winds and clouds, which we cannot perceive by any exterior sign, influence however the strata of air in which we make our experiments, produce these changes of which we only see the result, without being able to assign either the cause or its rela-

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electrici-
ty.

substance whose electricity is to be explored, will diminish the tension or repulsive force of this substance; and the quantity diminished by the contact of the ball will give the ratio of the capacity of this substance with that of the ball. Let us suppose a Leyden phial uninsulated, but so concealed, that only the knob is visible, and we are therefore ignorant of its size, and the strength of the shock it will give. Let the top of M. Saussure's electrometer be in contact with the knob of the bottle, and the balls of the electrometer separate 6 lines, — from this solitary fact, we shall gain no information relative to the force of the shock; because, if the jar is very large, this degree of tension will give a very painful sensation; when, if it is very small, with the same indicated tension, the sensation may be almost imperceptible. But if we bring a ball of a foot diameter, in contact with the knob of the bottle, and after having thus taken a part of the fluid therefrom, the electrometer is again put in contact with the knob thereof, the remaining quantity of repulsive force will show the relation between its contents and that of the globe of metal, and by this means the intensity of its charge.

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relation. Thus, in stormy weather, we see the electricity strong, then null, and in a moment after arise to its former force; one instant positive, the next negative, without being able to assign any reason for these changes. M. Sauffure says, that he has seen these changes succeed with such rapidity, that he had not time to note them down.

When rain falls without a storm, these changes are not so sudden; they are, however, very irregular, particularly with respect to the intensity of force; the quality thereof is more constant. Rain or snow almost uniformly gives positive electricity.

In cloudy weather, without rain or storms, the electricity follows generally the same laws as in serene weather.

Strong winds generally diminish its intensity; they mix together the different strata of the atmosphere, and make them pass successively towards the ground, and thus distribute the electricity uniformly between the earth and the air. M. Sauffure has observed a strong electricity with a strong north wind.

The state of the air in which the electricity is strongest, is foggy weather: this is always accompanied with electricity, except when the fog is going to resolve into rain.

176
A periodic flux and reflux observable in the electricity of the atmosphere.

The most interesting observations, and those which throw the greatest light upon the various modifications of electricity in our atmosphere, are those that are made in serene weather. In winter (during which most of M. Sauffure's observations were made), and in serene weather, the electricity was generally weakest in an evening, when the dew had fallen, until the moment of the sun's rising: its intensity afterwards augmented by degrees, sometimes sooner and sometimes later; but generally before noon, it attained a certain maximum, from whence it again declined, till the fall of the dew, when it would be sometimes stronger than it had been during the whole day; after which, it would again gradually diminish during the whole night; but it is never quite destroyed, if the weather is perfectly serene.

Atmospherical electricity seems, therefore, like the sea, to be subject to a flux and reflux, which causes it to increase and diminish twice in 24 hours. The moments of its greatest force are some hours after the rising and setting of the sun; those when it is weakest, precede the rising and setting thereof.

177
M. Sauffure's observations on this subject in an extraordinary degree of cold.

M. Sauffure has given an instance of this periodic flux in electricity: On the 22d of February 1785, (one of the coldest days ever remembered at Geneva), the hygrometer and thermometer were suspended in the open air on a terrace exposed to the south-west; the electrometer, from its situation, indicated an electricity equal to what it would have shown if it had been placed on an open plain. The height of the barometer was reduced to what it would have been if the mercury had been constantly at the temperature of 10 degrees of Reaumur's thermometer. The place of observation was elevated 60 feet above the level of the lake. The observations of the day preceding and following this great cold were marked down by him; because it is pleasing to have these which precede and follow any singular phenomena. There was a weak S. W. wind during the whole three days; and it is rational.

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ther remarkable, that most of the great colds, which have been observed at Geneva, were preceded by, or at least accompanied with, a little S. W. breeze.

From the first 18 observations made during these three days, when the sky was quite serene, we learn that the electricity was pretty strong at nine in the morning; that from thence it gradually diminished till towards six in the evening, which was its first minimum; after which it increased again till eight, its second maximum; from whence it again gradually declined till fix the next morning, which was the time of its second minimum; after which, it again increased till ten in the morning, which was the first maximum of the following day; as this was cloudy, the electric periods were not so regular.

179
The electricity of serene weather is much weaker in summer than in winter, which renders it more difficult to observe these gradations in summer than in winter; besides a variety of accidental causes, which at the same time render them more uncertain. In general, in summer, if the ground has been dry for some days, and the air is dry also, the electricity increases from the rising of the sun till three or four in the afternoon, when it is strongest; it then diminishes till the dew begins to fall, which again reanimates it; tho' after this it declines, and is almost extinguished during the night.

But the serene days that succeed rainy weather in summer, generally exhibit the same diurnal periods or states of electricity, as are to be observed in winter.

200
The air is invariably positive in serene weather, both in winter and summer, day and night, in the sun or in the dew. It would seem, therefore, that the electricity of the air is essentially positive; and that whenever it appears to be negative, in certain rains or in storms, it probably arises from some clouds, which have been exposed to the pressure of the electric fluid contained in the upper part of the atmosphere, or to more elevated clouds that have discharged a part of their fluid upon the earth, or upon other clouds.

In order to find out the cause of these phenomena, M. Sauffure instituted a set of experiments on evaporation, avoiding the use of M. Volta's condenser.

201
To produce a strong evaporation, he threw a mass of red hot iron into a small quantity of water, which was contained in a coffee-pot with a large mouth, and suspended by silk strings; by this he obtained a strong positive electricity; though, according to M. Volta's system, it ought to have been negative: the experiment was repeated several times, varying some of the circumstances, but the result was always the same.

As it was not easy to think so able a philosopher as M. Volta was deceived, it was necessary to try the experiment in a manner more analogous to that of M. Volta. A small chafing-dish was therefore insulated by silk cords, and the coffee-pot, with a small quantity of water, placed on it; one electrometer was connected with the coffee-pot and another with the chafing-dish; the fire was raised by a pair of bellows; when the water had boiled strongly for a few minutes, both electrometers exhibited signs of electricity, which, on examination, was found to be negative; proving the truth of M. Volta's experiment.

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The evaporation produced by the effervescence of iron in the vitriolic acid, and by that of chalk in the same acid, gave also negative electricity.

202
Immense quantity of electricity extracted from volcanoes, &c.

It was now necessary to inquire, why the vapour, excited by the heated iron, produced positive electricity; while that from boiling water in any other way produced a negative electricity?

M. Saussure suspected, that the intensity of heat to which the water is exposed, by the contact of a body in a state of incandescence, was the cause of the electricity produced by its evaporation; and that a combination was then formed, by which a new quantity of the electric fluid was produced. This conjecture may at first sight seem improbable; but the quantity of electricity produced by this experiment will astonish those that repeat it: and this quantity is the more surprising, because, if it is true, according to the system of M. Volta, that the waters absorb, while they are forming a quantity of the electric fluid, there must, therefore, be enough developed in this experiment for the formation of the great quantity of vapours produced by the heated iron, and afterwards a sufficient quantity to electrify strongly the apparatus, and all these vapours.

This experiment shows clearly the cause of that prodigious quantity of electricity which is unfolded in the eruption of volcanoes; as it is probable that the water in these, from many circumstances, acquires a much greater degree of heat than is given to it in our experiments.

203
Positive electricity always produced by the combustion of iron.

To verify this conjecture, that it was in some measure the combustion of the water or the iron that produced the positive electricity, it was proper to try whether, by a regular moderation of the heat of the iron, positive electricity would always be obtained. This was essayed in the following manner: A large iron crucible, five inches high, four in diameter, and six lines thick, was heated red hot, then insulated; after which, small quantities of water were thrown into it, each projection of the water cooling more and more the crucible; thus descending by degrees till there was only sufficient heat to boil the water; carefully observing, and then destroying, the electricity produced at each projection. The electricity was always positive or null; at the first projections it was very strong; it gradually diminished to the twelfth, when it was scarce sensible, though always with a tendency to be positive.

On repeating this experiment, and varying it in different ways, a remarkable circumstance was observed: When a small quantity of water was thrown into the crucible, the moment it was taken from the fire, while it was of a pale red, approaching what is called the *white heat*, no electricity was obtained.

204
Water evaporates more slowly on a red hot metal than on one heated to a lesser degree.

This fact seemed to have some connection with another mentioned by Musschenbroek, that water evaporates more slowly on a metal, or any other incandescent body, than on the same body, heated only a small degree above boiling water. To examine this relation, and to find whether there was any between the periods of evaporation and the production of electricity, M. Saussure made a great number of experiments, which are most accurately described in his work; but as the detail would be much too long, we

shall only present the reader with the heads thereof, and a description of the apparatus.

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The apparatus consisted of a pot of clay, well baked or annealed, 15 lines thick and 4 inches diameter; this was insulated by a dry glass goblet; upon this pot was placed the crucible, or any other heated substance on which the water was to be thrown, in order to be reduced into vapour; the crucible was contiguous to a wire connected with an electrometer; a measure, containing 54 grains weight of distilled water, was thrown upon the heated crucible: the time employed in the evaporation thereof was observed by a second watch; the electricity produced by this evaporation was noted. When this measure of water was reduced into vapour, the electricity of the apparatus is destroyed, and a fresh measure of water is thrown into the crucible, proceeding in the same manner till the crucible is almost cold.

205
Apparatus for making the experiments.

The first experiment was with an iron crucible, from which it was found that Musschenbroek was not right in saying that the evaporation was slowest when the iron was hottest; for at the instant it was taken from the fire, it required 19 seconds to evaporate the water, and took more time till the third projection, when it took 35 seconds, though from that period it employed less time, or in other words, the evaporation accelerated in proportion as the iron cooled.

206
Experiments with this apparatus.

With respect to the electricity, it was at first 0, then positive, afterwards negative, then 0, and afterwards positive to the end of the experiment. The vapour was not visible till the 7th projection.

In the second experiment with the same crucible, though every endeavour was made use of to render them as similar as possible, the electricity was constantly positive.

The third experiment was with a copper crucible: here also the electricity was positive; and the longest time employed in evaporation was not the instant of the greatest heat. It was very curious to see the water endeavouring to gather itself into a globule, like mercury on glass, to be sometimes immovable, and then to turn on itself horizontally, with great rapidity; sometimes throwing from some of its points a little jet, accompanied with an hissing noise.

The fourth experiment was with the same crucible: the electricity was at first negative, then constantly positive.

The fifth was with a crucible of pure silver: a considerable time was employed here in evaporating the same quantity of water; even in the instant of the greatest heat it took 5 minutes 6 seconds; the electricity was weak; three times no electricity was perceived; five times negative electricity was discovered.

In a sixth experiment with the same crucible, a positive electricity was obtained at the second projection, after which none of any kind was perceived.

The seventh with the same, gave at first a strong negative electricity; the second and third projection gave a weak positive electricity.

The eighth was made with a porcelain cup: here the evaporation was slower at the second than the first projection; but from this it took longer time till it was cold.

207
Cold.

Methods of cold, contrary to what happened with the metals; the electricity was always negative.

The ninth and tenth experiments with the same cup produced similar effects.

The eleventh experiment was with Spirits of wine in a silver crucible: there was no electricity produced at the two first projections, and what was afterwards obtained was negative.

Twelfth experiment with ether: here the electricity was also negative. These two inflammable fluids, in evaporating, followed the same laws as water, being dissipated at first most rapidly in the greatest heat, afterwards taking a longer and longer time before they were evaporated to a certain period, then employing less time, or evaporating quicker, till the crucible was nearly cold.

Now as china and silver always produced negative electricity, while iron and copper have generally given positive electricity, we may conclude, that electricity is positive with those bodies that are capable of decomposing water, or of being decomposed themselves by their contact with the water; and negative with those which are not at all decomposed or altered.

From hence M. Saussure conjectures, that the electric fluid may be looked upon as formed by the union of fire with some unknown principle, perhaps a fluid analogous to inflammable air, but exceedingly more subtle. This analogy seems to him sufficiently proved by the inflammation of the electric fluid, and by the diminution of the air in which this inflammation is made. Though many doubts have been attempted to be thrown on this inflammation, there seems to be one reason which forces us to admit it, which is the loss of a quantity of this fluid at every spark; we may diminish at pleasure any quantity of this fluid by taking a number of sparks from it. From whence also it may be inferred, that a considerable quantity is destroyed every day by thunder.

According to this system, when the operation, which converts water into vapour, produces at the same time a decomposition, it then generates the electric fluid. A part of this fluid combines itself immediately with these vapours, and serves even to form them. The vessel in which this operation is performed, will acquire a positive electricity, none at all, or a negative, according as the quantity of the fluid generated is superior, equal, or inferior to that which the formation of the vapour consumes. When no decomposition accompanies the evaporation, the electricity ought to be constantly negative, because there is nothing to replace the quantity of this fluid which is employed in forming the vapour.

If in the foregoing experiments, those substances were susceptible of calcination had constantly given a positive electricity, and those which do not calcine had always given the negative, every thing would have been explained by these principles, and they would thence have acquired a greater degree of probability: but the phenomena have not always followed this law. We have seen iron and copper sometimes give a negative electricity, and silver the positive. The first case is not difficult to account for; it is well known with what facility iron and copper calcine in a brisk fire; they become covered with a scaly crust,

which is not susceptible of any further alteration with the same heat. If the bottom of the crucible acquires this crusty coating, the drop of water placed thereon will be no longer in contact with a calcinable substance; there will be no farther decomposition, no generation of the electric fluid: the vapours, however, which are still formed, will absorb a part of the fluid naturally contained in the apparatus, and this will therefore be electrified negatively. If some of the scales should be so far detached, that the water may gain some points of contact, the quantity thus generated may compensate for what is absorbed by the vapours, and thus the electricity will be null. If more are detached, it will superabound and be positive. For the same reasons, a large mass of water, by attacking the iron in a greater number of points, always gives positive electricity; and hence, also, a strong positive electricity is obtained, by throwing a piece of red-hot iron into a mass of water.

It is not so easy to explain why silver gives sometimes a positive electricity, but by supposing it to have been mixed with some substances capable of calcination; and this the more, as the white porcelain always gave negative electricity. This supposition was verified by some subsequent experiments, in which the same silver, when purified, always gave a negative electricity.

M. Saussure owns himself incapable of explaining why heated charcoal always gives negative electricity; unless it can be attributed to the promptitude with which so rare a substance loses its heat by the contact of water.

One fact astonished him, namely, that by combustion properly so called, although it is an evaporation, nay, the highest degree of evaporation, he never obtained any signs of electricity, though he tried to obtain it in a variety of ways. Probably the current produced by the flame disperses and dissipates the electricity as soon as it is formed. The case, however, must not be looked upon as general, because M. Volta obtained signs of electricity from bodies in combustion by means of his condenser.

Another singular fact was, his not being able to obtain electricity without ebullition, though he endeavoured to compensate by the quantity of surface for the quantity of vapours that were elevated by boiling water; and indeed, the same quantity of water, if extended over too large a surface, will not give any electricity.

But of all the instruments by which it hath been attempted to measure electricity, none have been found to answer the purpose equally well with that invented by Mr Bennet, of which an account is given in the 77th volume of the Philosophical Transactions, and which is represented fig. 64. It consists of two slips of leaf gold, *aa*, suspended in a glass cylinder *b*. The foot *c* may be made of wood or metal, and the cap *d* of metal; the latter being made flat at top for the convenience of putting any thing upon it that is to be electrified. The cap is about an inch wider than the diameter of the glass, and its rim about three quarters of an inch broad, hanging parallel to the glass to keep it sufficiently insulated, and to turn off the rain. Within this is another circular rim about half as broad as the former, lined with silk or velvet, so that

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278
Signs of electricity, obtained from combustion.

279
Mr Bennet's electrometer described.

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Saussure's conjecture concerning the nature of the electric fluid.

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Consequences of M. Saussure's system.

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Observations upon it.

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it may be made to fit the outside of the glass exactly, while the cap may be easily taken off to repair any accident happening to the gold-leaf. From the centre of the cap hangs a tin tube somewhat longer than the depth of the inner rim, in which a small peg *f* is placed, which may be taken out occasionally. To this peg, which is rounded at one end and flat at the other, two slips of leaf-gold are fastened with paste, gum-water, or varnish. These are about a fifth-part of an inch broad, and two inches long, tapering to a sharp point. In one side of the cap is a small tube *g*, to place wires in: *bb* are two long pieces of tin-foil fastened with varnish on opposite sides of the internal surface of the glass, where the leaf-gold may be expected to strike, and in connection with the foot. The upper end of the glass is covered and lined with sealing-wax as low as the outermost rim, to make the insulation more perfect. An improvement on this electrometer is to make the cylinder pretty long, and to have a small additional tube of gum-lac on the end of it. The slips of tin-foil reach almost to the edge of the outer rim, and are sharp pointed at top; widening in the middle, and decreasing in breadth again as they descend.

212 Its extreme sensibility.

The sensibility of this electrometer is extreme, as appears from the following examples.

1. On putting powdered chalk into a pair of bellows, and blowing it upon the cap, the latter was electrified positively when the nozzle of the bellows was about six inches from it; but at the distance of three feet from the nozzle, the same stream electrified it negatively. Thus it appears that the electricity may be changed from positive to negative from the mere circumstance of the wider diffusion of this stream of chalk in the air. It may also be changed by placing a bunch of fine wire, silk, or feathers, in the nozzle of the bellows; and it is likewise negative when blown from a pair of bellows without their iron-pipe, so that it may come out in a larger stream: but this last experiment was found to answer best in wet weather. There is likewise a remarkable difference between the experiment in which the electricity is positive and that in which it is negative; the former being communicated with some degree of permanency to the cap, so that the gold-leaf continues for some time to diverge; but the latter being only momentary, and the gold-leaf collapsing as soon as the cloud of chalk is dispersed. The reason why the former continues is, that the chalk sticks to the cap.

2. A piece of chalk drawn over a brush, or powdered chalk put into the brush, and projected upon the cap, electrifies it negatively; but its electricity is not communicated.

3. Powdered chalk blown with the mouth or bellows from a metal plate placed upon the cap, electrifies it permanently positive. Or if the chalk is blown from the plate, either insulated or not, so that the powder may pass over the cap, if not too far off, it is also positive. Or if a brush is placed upon the cap, and a piece of chalk drawn over it, when the hand is withdrawn, the leaf gold gradually opens with positive electricity as the cloud of chalk disperses.

4. Powdered chalk falling from one plate to another placed upon the instrument, electrifies it negatively.

Other methods of producing electricity with chalk

and other powders have been tried; as projecting chalk from a goose wing, chalking the edges of books and clapping the book suddenly together, also lifting the powder upon the cap; all which electrified it negatively: but the instrument being placed in a dusty road, and the dust struck up with a stick near it, electrified it positively. Breaking the glass-tear upon a book electrified it negatively, but when broken in water it did not electrify it.

Wheat-flour and red-lead are strongly negative in all cases where the chalk is positive. The following powders were like chalk: red ochre and yellow rosin, coal ashes, powdered crocus metallorum, aurum mosaicum, black-lead, lampblack (which was only sensible in the two first methods), powdered quick-lime, umber, lapis calaminaris, Spanish brown, powdered sulphur, flowers of sulphur, iron-s filings, rust of iron, sand. Rosin and chalk, separately alike, were changed by mixture; this was often tried in dry weather, but did not succeed in damp: white lead also sometimes produced positive and sometimes negative electricity when blown from a plate.

If a metal cup be placed upon the cap with a red-hot coal in it, a spoonful of water thrown in electrifies the cap negatively; and if a bent wire be placed in the cap, with a piece of paper fastened to it to increase its surface, the positive electricity of the ascending vapour may be tried by introducing the paper into it. Perhaps the electrification of fogs and rain is well illustrated by pouring water through an insulated cullender, containing hot coals, where the ascending vapour is positive and falling drops negative.

The sensibility of this electrometer may be considerably increased by placing a candle upon the cap. By this means, a cloud of chalk, which in the other case only just opens the leaf-gold, will cause it to strike the sides for a long time together; and the electricity, which was not before communicated, now passes into the electrometer, causing the leaf-gold to repel after it is carried away. Even sealing-wax by this means communicates its electricity at the distance of 12 inches at least, which it would scarcely otherwise do by rubbing upon the cap.

A cloud of chalk or wheat flower may be made in one room, and the electrometer with its candle be afterwards leisurely brought from another room, and the cloud will electrify it before it comes very near. The air of a room adjoining to that wherein the electrical machine was used, was very sensibly electrified, which was perceived by carrying the instrument through it with its candle.

In very clear weather, when no clouds were visible, the electrometer has been often applied to the insulated string of kites without metal, and their positive electricity caused the leaf-gold to strike the sides; but when a kite was raised in cloudy weather with a wire in the string, and when it gave sparks about a quarter of an inch long, the electricity was sensible by the electrometer at the distance of ten yards or more from the string; but when placed at the distance of six feet, the leaf-gold continued to strike the sides of the electrometer for more than an hour together, with a velocity increasing and decreasing with the density or distance of the unequal clouds which passed over.

Sometimes the electricity of an approaching cloud has.

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213 Considerably augmented by means of a lighted candle.

214 Its application to electrified kites.

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215 Other experiments, showing the great sensibility of this electrometer.

has been sensible without a kite, though in a very unfavourable situation for it, being in a town surrounded with hills, and where buildings encompassed the wall on which the electrometer was placed. A thunder-cloud passing over, caused the leaf-gold to strike the sides of the glass very quick at each flash of lightning.

No sensible electricity is produced by blowing pure air, projecting water, by smoke, flame, or explosions of gunpowder.

A book was placed upon the cap, and struck with silk, linen, woollen, cotton, parchment, and paper, all which produced negative repulsion; but when the other side of the book was struck with silk, it became positive; this side, struck at right angles with the former, was again negative; and by continuing the strokes which produced positive, it changed to negative for a little while; and, by stopping again, became positive. No other book would do the same, though the sides were scraped unchalked, upon a supposition that altering the surface would produce it. At last, one side of a book was moistened, which changed it; whence it was concluded, that one edge of the book had lain in a damp place; which conjecture was farther confirmed by all the books becoming positive in damp weather, and one of them being dried at the fire again became negative.

When the cap is approached with excited sealing-wax, the leaf-gold may be made to strike the sides of the glass more than twelve times; and as the sealing-wax recedes, it strikes nearly as often; but if it approaches much quicker than it recedes, the second number will sometimes be greater.

The quantity of electricity necessary to cause a repulsion of the leaf-gold is so small, that the sharpest point or edges do not draw it off without touching; hence it is unnecessary to avoid points or edges in the construction of this instrument.

To the experiments on blowing powders from a pair of bellows it may be added, that if the powder is blown at about the distance of three inches upon a plate which is moistened or oiled, its electricity is contrary to that produced by blowing upon a dry plate. This shows that the electricity of the streams of powder issuing out of the bellows is only contrary to the more expanded part, because it is within the influence of its atmosphere; for when this is destroyed by the adhesion of the powder to the moistened plate, it is negative when the bellows are positive, as it was before positive when the more expanded cloud was negative.

The experiments on evaporation of water may be tried with more ease and certainty of success by heating the small end of a tobacco-pipe, and pouring water into the head; which running down to the heated part, is suddenly expanded, and will show its electricity when projected upon the cap of the electrometer more sensibly than any other way that has been tried. If the pipe be fixed in a cloven stick, and placed in the cap of one electrometer whilst the steam is projected upon another, it produces both electricities at once. Spirit of wine and ether are electrified like water. Oil and vitriolic acid produced smoke without any change of electricity. In these experiments a long pipe is better than a short one.

Besides these instruments, there are several others invented by Mr Cavallo which answer the purpose of obser-

ving the electricity of the atmosphere extremely well, tho' not with such great accuracy as that just now described; and of which he gives the following account.

"Fig. 67. represents a very simple instrument for making experiments on the electricity of the atmosphere; and which, on several accounts, seems to be the most proper for that purpose. *AB* is a common jointed fishing-rod, without the last or smallest joint. From the extremity of this rod proceeds a slender glass tube *BC*, covered with sealing-wax, and having a cork *D* at its end, from which a pith-ball electrometer is suspended. *HGI* is a piece of twine fastened to the other extremity of the rod, and supported at *G* by a small string *FG*. At the end (*I*) of the twine a pin is fastened; which when pulled into the cork *D*, renders the electrometer *E* uninsulated. When *I* would observe the electricity of the atmosphere with this instrument, I thrust the pin (*I*) into the cork *D*; and holding the rod by its lower end *A*, project it out from a window in the upper part of the house, into the air, raising the end of the rod with the electrometer, so as to make an angle of about 50° or 60° with the horizon. In this situation I keep the instrument for a few seconds; and then pulling the twine at *H*, the pin is disengaged from the cork *D*: which operation causes the string to drop in the dotted situation *KL*, and leaves the electrometer insulated, and electrified with an electricity contrary to that of the atmosphere. This done, I draw the electrometer into the room; and examine the quality of the electricity without obstruction either from wind or darkness. With this instrument I have made observations on the electricity of the atmosphere several times in a day for several months."

His electrometer for rain is shown Plate CLXXVII. His description, fig. 70. and of this he gives the following description, trometer for rain.

"*ABCI* is a strong glass tube about two feet and a half long, having a tin funnel *DE* cemented to its extremity, which funnel defends part of the tube from the rain. The outside surface of the tube from *A* to *B* is covered with sealing-wax; so also is the part of it which is covered by the funnel. *FD* is a piece of cane, round which brass wires are twisted in different directions, so as to catch the rain easily, and at the same time to make no resistance to the wind. This piece of cane is fixed into the tube; and a slender wire proceeding from it goes through the bore of the tube, and communicates with the strong wire *AG*, which is thrust into a piece of cork fastened to the end *A* of the tube. The end *G* of the wire *AG* is formed in a ring, from which I suspend a more or less sensible pith-ball electrometer as occasion requires. This instrument is fastened to the side of the window-frame, where it is supported by strong brass hooks at *CB*; which part of the tube is covered with a silk lace, in order to adapt it better to the hooks. The part *FC* is out of the window, with the end *F* elevated a little above the horizon. The remaining part of the instrument comes through a hole in one of the lights of the sash within the room, and no more of it touches the side of the window than the part *CB*. When it rains, especially in passing showers, this instrument, standing in the situation above described, is frequently electrified; and, by the diverging of the electrometer, the quantity and quality of the electricity of the rain may be observed without any danger of a mistake. With this instrument I have observed,

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217 Mr Cavallo's instrument for observing the electricity of the atmosphere.

216 How to make experiments on the evaporation of water.

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&c.

served, that the rain is generally, though not always, electrified negatively; and sometimes so strongly, that I have been able to charge a small coated phial at the wire *A.G.* This instrument should be fixed in such a manner that it may be easily taken off from the window and replaced again as occasion requires; for it will be necessary to clean it very often, particularly when a shower of rain is approaching."

219
All these
instruments im-
perfect.

Notwithstanding the great accuracy of these instruments, however, there are still many degrees of electricity too small to be observed by any of them. To be able to collect these, it is necessary to have one capable of retaining the electricity it receives for a considerable time, and of allowing it to accumulate till it becomes capable of being measured by some of the common methods. Upon instruments of this kind Mr Cavallo gives the following dissertation.

220
Mr Caval-
lo's disserta-
tion on
measuring
small de-
grees of
electricity.

" Besides the way of ascertaining small quantities of electricity by means of very delicate electrometers, two methods have been communicated to the philosophical world, by which such quantities of electricity may be rendered manifest as could not be perceived by other means. The first of those methods is an invention of M. Volta, the apparatus for it being called the *condenser of electricity*, and is described in the *Philosophical Transactions*, Vol. LXXXII. The second is a contrivance of the above-mentioned Mr Bennet, who calls the apparatus *the doubler of electricity*. A description of it is inserted in the *Philosophical Transactions*, Vol. LXXVII.

221
Volta's
condenser.

" M. Volta's condenser consists of a flat and smooth metal plate, furnished with an insulating handle, and a semiconducting, or imperfectly insulating, plane. When one wishes to examine a weak electricity with this apparatus, as that of the air in calm and hot weather, which is not generally sensible to an electrometer, he must place the above-mentioned plate upon the semiconducting plane, and a wire, or some other conducting substance, must be connected with the metal plate, and must be extended in the open air, so as to absorb its electricity; then, after a certain time, the metal plate must be separated from the semiconducting plane; and being presented to an electrometer, will electrify it much more than if it had not been placed upon the above-mentioned plane.

" The principle on which the action of this apparatus depends is, that the metal plate, whilst standing contiguous to the semiconducting plane, will both absorb and retain a much greater quantity of electricity than it can either absorb or retain when separate, its capacity being increased in the former and diminished in the latter case.

" Whoever considers this apparatus, will easily find, that its office is not to manifest a small quantity of electricity, but to condense an expanded quantity of electricity into a small space: hence, if by means of this apparatus one expected to render more manifest than it generally is, when communicated immediately to an electrometer, the electricity of a small tourmalin, or of a hair when rubbed, he would find himself mistaken.

222
Mr Ben-
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jected to.

" It is Mr Bennet's doubler that was intended to answer that end; viz. to multiply, by repeated doubling, a small, and otherwise unperceivable, quantity of elec-

tricity, till it became sufficient to affect an electrometer, to give sparks, &c. The merit of this invention is certainly considerable; but the use of it is far from precise and certain.

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&c.

" This apparatus consists of three brass plates, which we shall call *A, B*, and *C*; each of which is about three or four inches in diameter. The first plate *A* is placed upon the gold-leaf electrometer, or it may be supported horizontally by any other insulating stand, and its upper part only is thinly varnished. The second plate *B* is varnished on both sides, and is furnished with an insulating handle, which is fastened laterally to the edge of it. The third plate *C* is varnished on the under side only, and is furnished with an insulating handle, which is perpendicular to its upper surface.

" This apparatus is used in the following manner. The plate *B* being laid upon the plate *A*, the small quantity of electricity, which is required to be multiplied, is communicated to the under part of the plate *A*, and at the same time the upper part of *B* is touched with a finger; then the finger is first removed; the plate *B* is afterwards removed from over the plate *A*. The plate *C* is now laid upon *B*, and its upper surface is touched, for a short time, with a finger. By this operation it is clear, that if the electricity communicated to the plate *A* is positive, the plate *B* must have acquired a negative electricity, and the plate *C* must have acquired the positive, viz. the same of the plate *A*. Now the plate *B*, being separated from *C*, is laid as before upon *A*; the edge of *C* is brought into contact with the under part of the plate *A*, and at the same time the upper part of *B* is touched with a finger; by which means the plate *B*, being acted upon by the atmospheres of both the plates *A* and *C*, will acquire nearly twice as much electricity as it did the first time, and of course will render the plate *C*, when that is laid upon it, proportionably more electrified than before: thus, by repeating this operation, the electricity may be increased to any required degree.

" The varnish on those surfaces of the plates which are to lie contiguous to each other, serves to prevent the metal of one touching the metal of the other; for in that case, instead of one plate causing a contrary electricity in the other, the electricity of the first would be gradually communicated to the others, and would be dissipated.

" As soon as I understood the principle of this contrivance, I hastened to construct such an apparatus, in order to try several experiments of a very delicate nature, especially on animal bodies and vegetables, which could not have been attempted before, for want of a method of ascertaining exceedingly small quantities of electricity; but after a great deal of trouble, and many experiments, I was at last forced to conclude, that the doubler of electricity is not an instrument to be depended upon, for this principal reason, viz. because it multiplies not only the electricity which is willingly communicated to it from the substance in question; but it multiplies also that electricity which in the course of the operation is almost unavoidably produced by accidental friction; so that quantity of electricity, however small it may be, which adheres to the plates in spite of every care and precaution.

" Having found, that with a doubler constructed in the above-described manner, after doubling or multiplying

Methods of multiplying 20 or 30 times, it always became strongly electrified, though no electricity had been communicated to it before the operation, and though every endeavour of depriving it of any adhering electricity had been practised; I naturally attributed that electricity which appeared after repeatedly doubling, to some friction given to the varnish of the plates in the course of the operation. In order to avoid entirely this source of mistake, or at least of suspicion, I constructed three plates without the least varnish, and which, of course, could not touch each other, but were to stand only within about one-eighth of an inch of each other. To effect this, each plate stood vertical, and was supported by two glass sticks, which were covered with sealing-wax. These were inserted into a wooden pedestal $7\frac{1}{2}$ inches long, $2\frac{1}{2}$ broad, and $1\frac{1}{4}$ inch thick, being kept fast by cement both to the pedestal and likewise to another piece of wood fastened to the back of the plate. The plate itself is of strong tin, and measures about eight inches in diameter. The stand projects very little before the plate; by which means, when two of those plates are placed upon a table facing each other, the wooden stands will prevent their coming into actual contact.

"I need not describe the manner of doubling or of multiplying with those plates; the operation being essentially the same as when the plates are constructed according to Mr Benner's original plan, excepting that, instead of placing them one upon the other, mine are placed facing each other; and in performing the operation they are laid hold of by the wooden stand *AB*; so that no friction can take place either upon the glass legs or upon any varnish; for these plates have no need of being varnished. Sometimes, instead of touching the plates themselves with the finger, I have fixed a piece of thin wire to the back of the plate, and have then applied the finger to the extremity of the wire, suspecting that some friction and some electricity might possibly be produced when the finger was applied in full contact to the plate itself.

"It is evident, that as the plates do not come so near to each other in this as they do in the other construction, the electricity of one of them cannot produce so great a quantity of the contrary electricity in the opposite plate: hence, in this construction, it will be necessary to continue the operation of doubling somewhat longer; but this disadvantage is more than repaid by the certainty of avoiding any friction.

"Having constructed those plates, I thought that I might proceed to perform the intended experiments without any further obstruction: but in this I found myself quite mistaken; for on trying to multiply with those new plates, and when no electricity had been previously communicated to any of them, I found, that after doubling 10, 15, or at most 20 times, they became so full of electricity as to afford even sparks. All my endeavours to deprive them of electricity proved ineffectual. Neither exposing them, and especially the glass sticks, to the flame of burning paper, nor breathing upon them repeatedly, nor leaving them untouched for several days, and even for a whole month, during which time the plates remained connected with the ground by means of good conductors, nor any other precaution I could think of, was found capable of depriving them of every vestige of electricity; so that

they might show none after doubling 10, 15, or at most 20 times.

"The electricity produced by them was not always of the same sort; for sometimes it was negative for two or three days together; at other times it was positive for two or three days more; and often it changed in every operation. This made me suspect, that possibly the beginning of that electricity was derived from my body, and being communicated by the finger to the plate that was first touched, was afterwards multiplied. In order to clear this suspicion, I actually tried those plates at different times, viz. before and after having walked a great deal, before and after dinner, &c. noting very accurately the quality of the electricity produced each time; but the effects seemed to be quite unconnected with the above mentioned concomitant circumstances; which independence was further confirmed by observing that the electricity produced by the plates was of a fluctuating nature, even when, instead of touching the plates with the finger, they had been touched with a wire, which was connected with the ground, and which I managed by means of an insulating handle.

"At last, after a great variety of experiments, which it is unnecessary to describe, I became fully convinced, that those plates did always retain a small quantity of electricity, perhaps of that sort with which they had been last electrified, and of which it was almost impossible to deprive them. The various quality of the electricity produced was owing to this, viz. that as one of those plates was possessed of a small quantity of positive electricity, and another was possessed of the negative electricity, that plate which happened to be the most powerful, occasioned a contrary electricity in the other plate, and finally produced an accumulation of that particular sort of electricity.

"Those observations evidently show, that no precise result can be obtained from the use of those plates; and of course, that when constructed according to the original plan, they are still more equivocal, because they admit of more sources of mistake.

"As these plates, after doubling or multiplying only four or five times, show no signs of electricity, none having been communicated to them before, I imagined that they might be useful so far only, viz. that when a small quantity of electricity is communicated to any of them in the course of some experiment, one might multiply it with safety four or five times, which would even be of advantage in various cases; but in this also my expectations were disappointed.

"Having observed, after many experiments, that, *ceteris paribus*, when I began to multiply from a certain plate, which we shall call *A*, the electricity which resulted was generally positive; and when I began with another plate *B*, viz. considered this plate *B* as the first plate, the resulting electricity was generally negative; I communicated some negative electricity to the plate *A*, with a view of destroying its inherent positive electricity. This plate *A* being now electrified negatively, but so weakly as just to affect an electrometer, I began doubling; but after having doubled three or four times, I found, by the help of an electrometer, that the communicated negative electricity in the plate was diminished instead of being increased; so that sometimes it vanished entirely, though by continuing the opera-

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tion it often began to increase again, after a certain period. This shows, that the quantity of electricity, which however small it may be, remains in a manner fastened to the plates, will help either to increase or to diminish the accumulation or multiplication of the communicated electricity, according as it happens to be of the same or of a different nature.

"After all the above mentioned experiments made with those doubling or multiplying plates, we may come to the following conclusion, viz. that the invention is very ingenious, but their use is by no means to be depended upon. It is to be wished that they may be improved so as to obviate the weighty objections that have been mentioned; the first desideratum being to construct a set of such plates as, when no electricity is communicated, they will produce none after having performed the operation of doubling for a certain number of times.

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Cavallo's
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electricity
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"Upon the whole, the methods by which small quantities of electricity may be ascertained with precision are, as far as I know, only three. If the absolute quantity of electricity be small and pretty well condensed, as that produced by a small tourmalin when heated, or by a hair when rubbed, the only effectual method of manifesting its presence, and ascertaining its quality, is to communicate it immediately to a very delicate electrometer, viz. a very light one, that has no great extent of metallic or of other conducting substance; because if the small quantity of electricity that is communicated to it be expanded throughout a proportionately great surface, its elasticity, and of course its power of separating the corks of an electrometer, will be diminished in the same proportion.

"The other case is, when one wants to ascertain the presence of a considerable quantity of electricity, which is dispersed or expanded into a great space, and is little condensed, like the constant electricity of the atmosphere in clear weather, or like the electricity which remains in a large Leyden phial after the first or second discharge.

224
His appa-
ratus for
this pur-
pose.

"To effect this, I use an apparatus, which in principle is nothing more than M. Volta's condenser, but with certain alterations, which render it less efficacious than in the original plan, but at the same time render it much less subject to equivocal results. I place two of the above described tin-plates upon a table, facing each other, and about $\frac{1}{4}$ th of an inch asunder. One of those plates, for instance *A*, is connected with the floor by means of a wire, and the other plate *B* is made to communicate, by any convenient means, with the electricity that is required to be collected. In this disposition the plate *B*, on account of the proximity of the other plate, will imbibe more electricity than if it stood far from it, the plate *A* in this case acting like the semiconducting plane of M. Volta's condenser, though not with quite an equal effect, because the other plate *B* does not touch it; but yet, for the very same reason, this method is incomparably less subject to any equivocal result. When the plates have remained in the said situation for the time that

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may be judged necessary, the communication between the plate *B* and the conducting substance which conveyed the electricity, must be discontinued by means of a glass stick, or other insulating body; then the plate *A* is removed, and the plate *B* is presented to an electrometer, in order to ascertain the quality of the electricity; but if the electrometer be not affected by it, then the plate *B* is brought with its edge into contact with another very small plate, which stands upon a semiconducting plane, after the manner of M. Volta's condenser (N); which done, the small plate, being held by its insulating handle, is removed from the inferior plane, and is presented to the electrometer; and it frequently happens, that the small plate will affect the electrometer very sensibly, and quite sufficient for the purpose; whereas the large plate itself showed no clear signs of electricity.

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&c.

"If it be asked, why I use the semiconducting plane for this small plate, and not for the large one? the answer is, first, because the large semiconducting plane is incomparably more difficult to be procured than the small one; and, secondly, because the small plane may be easily deprived of any accidental electricity which may adhere to it; but the large one is more difficultly rendered fit for the purpose, especially as the large plate ought in general to remain upon it a much longer time than the small plate is to remain upon its semiconducting plane.

"The third and last case is, when the electricity to be ascertained is neither very considerable in quantity nor much condensed; such is the electricity of the hair of certain animals, of the surface of chocolate when cooling, &c. In this case the best method is to apply a metal plate, furnished with an insulating handle, like an electrophorus plate, to the electrified body, and to touch this plate with a finger for a short time whilst standing in that situation; which done, the plate is removed, and is brought near an electrometer; or its electricity may be communicated to the plate of a small condenser, as directed in the preceding case, which will render the electricity more conspicuous. It is evident, that in this case the metal plate will acquire the electricity contrary to that of the substance in question; but this answers the same purpose; for if the electricity of the plate be found to be positive, one must conclude, that the electricity of the body in question is negative, and contrariwise. In this operation, care must be had not to put the metal plate too near, or in full contact with the substance to be examined, lest the friction, likely to happen between the plate and the body, should produce some electricity, the origin of which might be attributed to other causes.

"Having thus far described the surest methods of ascertaining the presence and quality of electricity, when its quantity or degree of condensation is small, I shall now beg leave to add some farther remarks on the subject of electricity in general, and which have been principally suggested by what has been mentioned.

"On the hypothesis of a single electric fluid, it is said, that every substance in nature, when not electrified

(N) This small plate is nearly of the size of a shilling, and the semiconducting plane is of wood covered with copal varnish.

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225 Every substance electrified at all times.

fied, contains its proper share of electric fluid, which is proportionate to its bulk, or to some other of its properties; and it is generally believed, that this equal or proportionate distribution of electric fluid takes place with the greatest part of natural bodies. However, the fact is far from being so; and I may venture to assert, that, strictly speaking, every substance is always electrified, viz. that every substance, and even the various parts of the same body, contain at all times more or less electric fluid than that quantity of it which it ought to contain, in order to be in an electrical equilibrium with the bodies that surround it.

"At first sight it may be thought quite immaterial to know, whether the electric fluid is dispersed in the just proportion among the various substances which are not looked upon as electrified, or whether it deviates in a small degree from that proportionate distribution; but it will hereafter appear, that one of those assertions will lead us to the explanation of an interesting phenomenon in electricity, whereas the other does not admit of it; besides, what is called a small difference of the proportionate distribution, inasmuch as it does not affect our instruments, may be sufficient for several operations of nature, which it is our interest to investigate.

"If we inquire what phenomena evince this altered distribution, or the actually electrified state of all bodies, the preceding observations will furnish some very unequivocal ones; especially that of the doubling plates made after my plan, which showed to be electrified even after having remained untouched for a whole month, during which time they had been in communication with the ground; for if each of them had contained an equal share of electric fluid, the electric atmosphere of one of them could not possibly occasion a contrary electricity in the other, and consequently no accumulation of that power could have happened.

226 Experiment showing the truth of this doctrine.

"A great number of instances are related in books on the subject of electricity, and in the Phil. Transf. of pieces of glass, of sulphur, of sealing-wax, &c. having remained electrified so far as to affect an electrometer for months after they had been excited, or even touched; but the following experiment will show, in a clearer manner, the great length of time that a quantity of electricity will remain upon a body.

"Having constructed a gold-leaf electrometer in the nicest manner I could, and which, on account of the non-conducting nature and construction of its upper part, could remain sensibly electrified for several hours together, I communicated some electricity to it, which caused the slips of gold-leaf to diverge with a certain angle; and as the electricity was gradually dissipated, the divergency diminished in the same proportion. Now, whilst this diminution of divergency was going on, I looked through a small telescope, and, by means of a micrometer, measured the chords of the angles of divergency, setting down the time elapsed between each pair of contiguous observations; and as the chord of the angle of divarication is in the direct simple proportion of the density of the electric fluid (A), I could by this means know how much electric fluid was lost by the electrometer in a certain time, and of course

what portion of the electricity first communicated to the electrometer still remained in it. Let us make the chord of the angle of divarication on first electrifying the electrometer, or rather when first observed, equal to 16; or let us conceive that quantity of electricity to be divisible into 16 equal parts.

"I observed, that, when the chord of the angle became equal to eight, the time elapsed between this and the first observation was one minute; when the chord became equal to four, the time elapsed between this point and the preceding observation was 3' 30"; when the chord became equal to two, the time elapsed since the preceding observation was 17'; and when the chord became equal to one, the time elapsed since the preceding observation was one hour and a quarter; after which the electrometer remained sensibly electrified for a long time.

"In repeating this experiment, the times elapsed between the corresponding observations did not follow strictly the same proportion of increase; nor did they increase regularly in the same experiments, which may be attributed in great measure to the inaccuracy in observing, and to the fluctuating state of the air; but it could be safely inferred from all the experiments, that the times required for the dispersion of the electricity were at least greater than the inverse duplicate proportion of the densities of the electricity remaining in the electrometer. And if we imagine, that they continue to diminish in the same proportion of increasing time, which is far from being an extravagant supposition, we shall find, by a very easy calculation, that about two years after the electrometer would still retain the $\frac{1}{16}$ th part of the electricity communicated to it in the beginning of the experiment; and as we do not know how far a quantity of electricity is divisible, or to what extent it may be expanded, we may conclude with saying, that strictly speaking the electrometer would remain electrified for many years.

"It may be inferred from this, as well as from many other experiments, that the air, or in general any substance, is a more or less perfect conductor of electricity, according as the electricity which is to pass through it is more or less condensed; so that if a given quantity of electric fluid be communicated to a small brass ball, one may take it away by simply touching the ball with a finger; but if the same quantity of electric fluid be communicated to a surface of about 100 or 1000 square feet, the touching with the finger will hardly take away any part of it.

"If it be asked, what power communicates the electricity, or originally disturbs the equilibrium of the natural quantity of electric fluid in the various bodies of the universe? we may answer, that the fluctuating electric state of the air, the passage of electrified clouds, the evaporation and condensation of fluids, and the friction arising from divers causes, are perpetually acting upon the electric fluid of all bodies, so as either to increase or diminish it, and that to a more considerable degree than is generally imagined.

"I shall conclude, with briefly proposing an explanation of the production of electricity by friction, which is dependent upon the above stated proposition,

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viz. that bodies are always electrified in some degree; and likewise upon the well known principle of the capacity of bodies for holding electric fluid being increased by the proximity of other bodies in certain circumstances.

"It seems to me, that the cylinder of an electrical machine must always retain some electricity of the positive kind, though not equally dense in every part of its surface; therefore, when one part of it is set contiguous to the rubber, it must induce a negative electricity in the rubber. Now, when, by turning the cylinder, another part of it (which suppose to have a less quantity of positive electricity than the preceding) comes quickly against the rubber; the rubber being already negative, and not being capable of losing that electricity very quickly, must induce a stronger positive electricity in the former part which is now opposite to it: but this part cannot become more positively electrified, unless it receives the electric fluid from some other body, and therefore some quantity of electric fluid passes from the lowest part of the rubber to this part of the glass; which additional quantity of electric fluid is retained by it alone only whilst it remains in contact with the rubber; for after that, its capacity being diminished, the electric fluid endeavours to escape from it. Thus we may conceive how every other part of the glass acquires the electric fluid, &c. and what is said of the cylinder of an electrical machine may, with proper changes, be applied to any other electric and its rubber."

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Cavallio's
instrument
for observing
small
quantities
of electricity.

An instrument for observing very small quantities of electricity has likewise been invented by the same author, and described in the second part of the volume just quoted. The properties of this machine, which from its office may be called a *collector of electricity*, are, *first*, that when connected with the atmosphere, the rain, or in short with any body which produces electricity slowly, or which contains that power in a very rarefied manner, it collects the electricity, and afterwards renders both the presence and quality of it manifest, by communicating it to an electrometer. *2dly*, This collecting power, by increasing the size of the instrument, and especially by using a second or smaller instrument of the like sort to collect the electricity from the former, may be augmented to any degree. *3dly*, It is constructed, managed, and preserved with ease and certainty; and it never gives, nor can it give, an equivocal result, as he has proved experimentally, and as will appear by considering its construction.

Plate CLXXVIII. exhibits two perspective views of this collector. Fig. 93. shows the instrument in the state of collecting the electricity; and fig. 94. shows it in the state in which the collected electricity is to be rendered manifest. An electrometer is annexed to each. The letters of reference indicate the same parts in both figures.

ABCD is a flat tin plate, 13 inches long and 8 inches broad; to the two shorter sides of which are soldered two tin tubes *AD* and *BC*, which are open at both ends. *DE* and *CF* are two glass sticks covered with sealing-wax by means of heat, and not by dissolving the sealing-wax in spirits. They are cemented into the lower apertures of the tin tubes, and also in the wooden bottom of the frame or machine at *E* and *F*; so that the tin plate *ABCD* is supported by those glass sticks in a vertical position, and is exceedingly

well insulated. *GHLKM* and *NOPV* are two frames of wood, which being fastened to the bottom-boards by means of brass hinges, may be placed so as to stand in an upright position and parallel to the tin-plate, as shown in fig. 94. or they may be opened, and laid upon the table which supports the instrument, as shown in fig. 93. The inward surfaces of those frames from their middle upwards are covered with gilt paper *XY*; but it would be better to cover them with tin-plates hammered very flat. When the lateral frames stand straight up, they do not touch the tin plate; but they stand at about one-fifth part of an inch asunder. They are also a little shorter than the tin-plate, in order that they might not touch the tin-tubes *AD*, *BC*. In the middle of the upper part of each lateral frame is a small flat piece of wood *S* and *T*, with a brass hook; the use of which is to hold up the frames without the danger of their falling down when not required, and at the same time it prevents their coming nearer to the tin-plate than the proper limit. It is evident, that when the instrument stands as shown in fig. 94. the gilt surface of the paper *XY*, which covers the inside of the lateral frames, stands contiguous and parallel to the tin-plate.

When the instrument is to be used, it must be placed upon a table, a window, or other convenient support; a bottle electrometer is placed near it, and is connected, by means of a wire, with one of the tin tubes *AD*, *BC*; and by another conducting communication the tin-plate must be connected with the electrified substance, the electricity of which is required to be collected on the plate *ABCD*: thus, for instance, if it be required to collect the electricity of the rain or of the air, the instrument being placed near a window, a long wire must be put with one extremity into the aperture *A* or *B* of one of the tin-tubes, and with the other extremity projecting out of the window. If it be required to collect the electricity produced by evaporation, a small tin pan, having a wire or foot of about six inches in length, must be put upon one of the tin-tubes, so that, the wire going into the tube, the pan may stand about two or three inches above the instrument. A lighted coal is then put into the pan, and a few drops of water poured upon it will produce the desired effect. Thus far may suffice with respect to the mechanical description of the instrument: the power and use of it will be made apparent by the following experiments.

1. Communicate to the tin-plate *ABCD* a quantity of electricity, for instance, as much as would very sensibly affect a common cork-ball electrometer; then, if the lateral frames *GHL*, *NOP*, stand upright, as in fig. 94. the electrometer *W* will show no divergence; but if the frames are opened and let down, as in fig. 93. the balls of the electrometer *W* will immediately repel each other, and by the approach of an excited piece of sealing-wax, the quality of the electricity may be easily ascertained after the usual manner. Put up the lateral frames again, and the electricity will apparently vanish; let them down, and the electricity will re-appear, and so on. If you touch any part of the tin-plate or tin-tubes with your finger, the electricity is thereby entirely removed, and that will be the case whether the lateral frames are up or down.

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2. Take an extended piece of tin-foil, about four yards square, and, holding it by a silk thread, electrify it so weakly as not to be capable of affecting an electrometer; then bring it in contact with the tin-plate of the collector, whilst the lateral frames are up. This done, remove the tin-foil, let down the lateral frames one after the other; and on doing this the electrometer *W* will immediately manifest a considerable degree of electricity. But if the electrometer were to show no sensible degree of electricity, a smaller collector, *viz.* one having a tin-plate of about four square inches, must be brought into contact with the tin-plate of the large collector, whilst the lateral frames of the latter only are down; and then the small collector being removed from the large one, its lateral frames are opened, and its tin-plate is presented to an electrometer, which will thereby be electrified to a much greater degree than the electrometer *W* was by the large collector.

3. Let a common cork-ball electrometer be fastened to an insulated conductor, having about two or three square feet of surface, and communicate to it such a quantity of electricity as may be sufficient to let the balls of the electrometer stand at about one inch asunder. In this state bring the conductor in contact with the tin-plate of the collector for a very short time, and it will be found, that the balls of its electrometer will immediately approach and touch each other, showing that the electricity of the conductor is gone to the plate of the collector; and, in fact, if you let down the lateral frames, the balls of the electrometer *W* will immediately repel each other to a very great degree.

It seems, therefore, to be clearly shown by these experiments, that the tin-plate of this instrument can collect and retain a vast quantity of electricity, when the conducting surfaces of the lateral frames are contiguous to it, in comparison to that quantity which it can either collect or retain when those surfaces are removed from its vicinity.

The quantity of electricity which the tin-plate *ABCD* is capable of collecting, principally depends on three circumstances, *viz.* 1st, on the distance between the tin-plate and the conducting lateral surfaces; the smaller that distance is, the greater being the collecting power: 2^{dly}, on the size of the instrument: and, 3^{dly}, on the quantity of electricity possessed by the body from which it must be collected or taken away.

The principle upon which the action of this instrument depends, is the same as that of the electrophorus of M. Volta's condenser, and of many other electrical experiments; namely, that a body has a much greater capacity for holding electricity when its surface is contiguous to a conductor which can easily acquire the contrary electricity, than when it stands not in that situation.

The electrical air thermometer, fig. 34. is an instrument designed to show the power of electricity by its rarefaction of the air through which the fluid passes. But though this instrument in theory might be supposed capable of manifesting the very least degrees of electricity, the rarefaction of the air by its means is so very small, that unless the power of electricity be very considerable, no expansion will be perceived. The instrument, however, certainly has its

uses, and many curious experiments may be performed with it. *AB* represents a glass cylinder having a brass cap, with a wire and knob passing through it, and which is cemented on the open part of the glass. The under part is inverted into a small dish *BC*, containing quicksilver or some other liquid, which may rise in the small tube *AH* by any expansion of the air in the cylinder *AB*. *CD* is an insulating stand, which serves to sustain the whole; *E* is an hook by which a communication may be made to the ground; and *F* another for connecting the whole with the prime conductor of an electrical machine. The discharges of electricity made by the sparks between the knobs *G* and *I* expand the air, and force up the fluid into the small tube *AH*; and its rise there is marked upon a graduated scale. This instrument will likewise answer for showing the diminution or increase of any kind of air by the electric spark, as well as its sudden expansion by a spark or shock of a phial. Mr Morgan has shown that the mercury in a common thermometer, if well made, may be raised by the electric blast.

In a treatise lately published by the Reverend Mr Abraham Bennet, he gives an account of the machine called the *doubler of electricity*, with some improvements upon it by Mr Nicholson; by which means the machine becomes less liable to the objections of Mr Cavallo above-mentioned. In its improved state, it consists of two insulated and immovable plates about two inches in diameter, and a moveable plate also insulated, which revolves in a vertical plane parallel to the two immovable plates, passing them alternately.

"The plate *A* is constantly insulated, and receives the communicated electricity. The plate *B* revolves; and when it is opposite the plate *A*, the connecting wires at the end of the cross piece *D* must touch the pins of *A* and *C* at *EF*, and a wire proceeding from the plate *B* must touch the middle piece *G*, which is supported by a brass, wooden, or other conducting pillar in connection with the earth. In this position, if electricity be communicated to the plate *A*, the plate *B* will acquire a contrary state; and passing forwards, the wires also moving with it by means of the same insulating axis, the plates are again insulated till the plate *B* is opposite to *C*, and then the wire at *H* touches the pin in *C*, connecting it with the earth, and communicating the contrary state of electricity to that of *B*, but of the same kind with that of *A*. By moving the handle still further, *B* is again brought opposite to *A*; and the connecting wires joining *A* and *C*, they both act upon *B*, which is connected with the earth as before, and nearly double its intensity, whilst the electricity of *C* is absorbed into *A*; because of the increased capacity of *A*, whilst opposed to *B*, capable by its connection with the earth of acquiring a contrary state sufficient to balance the influential atmospheres of both plates.

"Thus by continuing to revolve the plate *B*, the process is performed in a very expeditious and accurate manner.

"The ball *I* is made heavier on one side than the other, and screwed upon the axis opposite to the handle, to counterbalance the plate *B*, which may therefore be stopped in any part of its revolution.

"Yet notwithstanding the convenience and accuracy of this doubler, it always produced spontaneous electricity,

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Mr. Bennet's doubler of electricity improved by Nicholson.

Plate CLXXXVI.
Fig. 65.

Plate CLXXXV.
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Electrical air thermometer.

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city, even after all the refinous substances used in its construction had been melted over a candle, and after standing a long time with its plates in connection with the earth. I therefore conjectured that this spontaneous electricity was not owing to accidental friction, but to the increased capacity of approximating parallel plates which might attract and retain their charge tho' neither of them were insulated. To prove my hypothesis, I first endeavoured more effectually and speedily to deprive the instrument of the electricity last communicated, and that I might know whether this spontaneous charge, supposed to arise from the increased capacity of the parallel plates, would be always of the same kind.

"To effect this deprivation, I connected the plates *A* and *C* together by a wire hooked at each end upon two small knobs on the backs of the plates, the middle of the same wire touching the pillar which supports the doubler. Another wire was hooked at one end upon the back of the plate *B*, and at the other end to the brass ball which counterbalances this plate. Thus all the plates were connected with the earth; and by turning the handle of the doubler, it might be discharged of electricity in every part of its revolution.

"After often trying this method of depriving the doubler, I observed that its spontaneous charge was almost always negative. I then touched *A* and *C* with a positively charged bottle, and turned the doubler till it produced sparks for a long time together; and after this strong positive charge, I hooked on the wires as above, and revolved the plate *B* about 100 times, which deprived the doubler of its positive electricity, that when the wires were taken off, it produced a negative charge at about the same number of revolutions which it required before.

"The positively charged bottle was again applied; and the wires being hooked upon the plates as before, *B* was revolved only 50 times; yet this was found sufficient to deprive it of its positive charge, and in many experiments 5 or 6 revolutions were sufficient: but I never thought it safe to stop at so few, and have therefore generally turned the handle 40 or 50 times between every experiment.

"Left electricity adhering to the electrometer should obstruct the above experiments, I did not let it stand in contact with the doubler during its revolutions, but touched the plate *A* with the cap of the electrometer, after I supposed its electricity was become sufficiently sensible: but left even this contact should communicate any electricity, I made a cap for my electrometer of shell-lac, having a small tin tube in the centre, to which the gold leaf was suspended within the glass, and a bent wire was fixed to the top, which might easily be joined to the plate *A* of the doubler; and thus the gold-leaf was more perfectly insulated, and the electricity could not be diffused over so large a surface. The glass which insulates the plates and cross piece of the doubler was also covered with shell-lac."

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Nicholson's
instrument
for distinguish-
ing
the two
electricities.

Fig. 66. shows an instrument invented by Mr Nicholson for distinguishing the two electricities from one another. *A* and *B* are two metallic balls placed at a greater or less distance from each other by means of the joint at *C*, the two branches *CA* being made of varnished glass. From one of the balls *B* proceeds a short point towards the other ball *A*. If the two be

placed in the course or current of the electric matter, so that it may pass through the air from one to the other, its direction will be known. For if the electric matter pass from *A* to *B*, there will be a certain distance of the balls dependent on the strength of electricity, within which the dense sparks will pass from the point; but if its course be in the contrary direction, no spark will be seen, unless the balls be almost in contact with the point.

We shall conclude this section with some observations on the electrical kite; which perhaps may after all be found, the only instrument that will certainly show the electricity of the atmosphere upon all occasions. The use of it, however, is very troublesome, as it obliges the observer always to go abroad, which sometimes must be disagreeable. By means of the apparatus represented fig. 72. this inconvenience may be avoided. *AB* represents the string of the kite, insulated by means of the silk cord *C*, tied about the foot of a table in the room where the experiments are to be made. This string passes out through a window of the room, and supports the kite; the electricity being conveyed by means of a small wire to the insulated conductor *D*, having a quadrant electrometer applied to it, as in the figure. *G* is a glass tube about 18 inches long, with a brass wire and knob proceeding from it; by taking a small spark with which from the conductor, the quality of the electricity may be observed.

Fig. 68. 69. represent a pocket electrometer, which may be very conveniently used when the atmospheric electricity is collected in any quantity. The case or electrometer is formed by a glass tube about three inches long and $\frac{1}{2}$ of an inch in diameter, half of which is covered with sealing-wax.

From one extremity of this tube, viz. that without sealing-wax, a small loop of silk proceeds, which serves occasionally to hang the electrometer on a pin, &c. To the other extremity of the tube a cork is adapted, which, being cut tapering on both ends, can fit the mouth of the tube with either end. From one extremity of this cork two linen threads proceed, a little shorter than the length of the tube, suspending each a little cone of pith of alder. When this electrometer is to be used, that end of the cork which is opposite to the threads is pushed into the mouth of the tube; then the tube forms the insulated handle of the pith electrometer, as represented fig. 69. But when the electrometer is to be carried in the pocket, then the threads are put into the tube, and the cork stops it as represented fig. 68. The peculiar advantages of this electrometer are, its convenient small size, its great sensibility, and its continuing longer in good order than any other. Fig. 68. represents a case to carry the above described electrometer in. This case is like a common toothpick-case, except that it hath a piece of amber fixed on one extremity *A*, which may occasionally serve to electrify the electrometer negatively; and on the other extremity it hath a piece of ivory fastened upon a piece of amber *BC*. This amber *BC* serves only to insulate the ivory; which when insulated, and rubbed against woollen cloths, acquires a positive electricity, and is therefore useful to electrify the electrometer positively.

In making experiments with the kite, it is sometimes necessary to act with caution, on account of the

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dangerous.

the great quantity of electricity collected by it. Of this we have already given some instances, to which we shall add the following from Mr Bennett; viz. that having on the 5th of July 1788 raised a kite with 200 yards of string, when it had been flying about an hour, a dark cloud appeared at a great distance, and changed the electricity from positive to negative. The electric power increased till the cloud became nearly vertical, when some large drops of rain fell; and our author attempting to secure the string from wet, received such a strong shock in his arm, as deprived it for a few seconds of sensation. The explosion was heard at the distance of about 40 yards, like the loud crack of a whip.

SECT. XI. Of the Effects of Electricity on Vegetation.

It is a very considerable time since electricians began to make experiments on this subject; and it was generally agreed that the electric fluid was favourable to the growth of vegetables. For a long time, however, such researches seem to have been laid aside; nor indeed did it seem very probable that any quantity of the fluid could be collected artificially sufficient to be of use. But in a late treatise the subject has been revived by the Abbe Bertholon; who not only shows a method of collecting the fluid from the atmosphere so as to be useful in ordinary practice, but endeavours to cure by means of this fluid some of those diseases to which plants are liable from insects, and which cannot be removed by any of the ordinary remedies.

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The upper
parts of the
atmosphere
always abound
with electric
matter.

"In the first place (says the Abbe), there is continually and every where diffused in the atmosphere (particularly in the upper regions) a considerable quantity of the electric fluid. On the mountains especially, it is always felt with most energy, and flows itself in greater abundance than on the plains. On the former, if you erect conductors, or launch electric paper-kites, in order to seek out and direct this fluid towards the surface of the earth, where several causes sometimes prevent its appearance; you will find it very soon subjected to your power, descend, as if at your command, from heaven itself, and creep at your feet to execute your orders. These are facts extremely well ascertained; but if you doubts of them, he has nothing to do but to erect a similar apparatus or set off electric kites to be convinced of the truth. These will immediately and at all times obtain an electricity so much the more strong as the height of the apparatus shall be the more considerable. Being informed, that in England this experiment was tried with the most convincing effect, I mention it, as it has hitherto not been published. Upon a high mountain there were launched two electric paper-kites, one of which was fixed to the inferior extremity of the other, thus gaining a double advantage in point of height; the consequence of which was, that the electric effects were incomparably greater than those produced by a single instrument. But I suppose it entirely useless to insist longer upon a fact so well demonstrated and universally admitted.

"This principle being granted: in order to remedy the deficiency of electric fluid which has already been proved to be hurtful to vegetation, we must erect in the spot which we want to fecundate the following new apparatus, which has had all possible suc-

cess, and which I shall call by the name of the *electro-vegetometer*. This machine is as simple in its construction as efficacious in its manner of acting; and I doubt not but it will be adopted by all those who are sufficiently instructed in the great principles of nature.

"This apparatus is composed of a mast *AB* (Plate CLXXX. fig. 82.), or a long pole thrust just so far into the earth as to stand firm and be able to resist the winds. That part of the mast which is to be in the earth must be well dried at the fire; and you must take care to lay on it a good coat of pitch and tar after taking it from the fire, that the resinous particles may enter more deeply into the pores of the wood, which will then be dilated, at the same time that its humidity will be expelled by the heat. Care must likewise be taken to throw around that part fixed in the earth a certain quantity of coal-dust, or rather a thick layer of good cement, and to build besides a base of masonry of a thickness and depth proportionable to the elevation of the instrument, so as to keep it durable and solid. As to the portion of it above the ground, it will be sufficient to put upon it some coats of oil paint, except one chooses rather to lay on a coat of bitumen the whole length of the piece.

"At the top of the mast there is to be put an iron-console or support *C*; whose pointed extremity you are to fix in the upper end of the mast, while the other extremity is to terminate in a ring, in order to receive the hollow glass-tube which is seen at *D*, and in which there is to be glued an iron rod rising with the point *E*. This rod, thus pointed at its upper extremity, is completely insulated, by reason of its keeping a strong hold of a thick glass-tube, which is filled with a quantity of bituminous matter, mixed with charcoal, brick-dust, and glass-powder; all together forming a sufficiently good and strong cement for the object in view.

To prevent rain wetting the glass tube, care must be taken to solder to the rod *E* a funnel of white-iron; which consequently is entirely insulated. From the lower extremity of the rod *E* hangs a chain *G*, which enters into a second glass-tube *H*, supported by the prop *I*. The lower end of the above-mentioned chain rests upon a circular piece of iron-wire, which forms a part of the horizontal conductor *KLMN*. In *L* is a breaker with a turning joint or hinge, in order to move to the right or left the iron-rod *LMN*; there is likewise another in *Q*, to give still greater effect to the circular movement. *O* and *P* are two supports terminating in a fork, where there is fixed a silken cord tightly stretched, in order to insulate the horizontal conductor: in *N* are several very sharp iron-points.

"In fig. 83. you see an apparatus in the main like the former, but with some difference in the construction. At the upper extremity of the mast *ab* there is bored a hole into which enters a wooden cylinder *c*, which has been carefully dried before a great fire, in order to extract its humidity, dilate its pores, and saturate it with tar, pitch, or turpentine, applied at repeated intervals. The more heat the wood and bituminous matter receives, the more the substance penetrates, and the insulation will be the more complete. It is moreover proper to besmear the circumference of the little cylinder with a pretty thick coat of bitumen. This preparation being made, we next insert the cylinder *c*

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form of this
instrument.

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Electro-vegetometer described.

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tion.

into the hole *b* of the maff; and it is eafy to join together thefe two wooden pieces in the moft perfect manner.

"At the upper extremity of the cylinder *c* we ftrongly attach an iron-rod *g*; which, inftead of one, is terminated by feveral fharp points all of gilded iron. In *e* you fee a branch of iron refembling the arm of an iron-crow, from whence hangs an iron chain *h*; at the end of which there is hooked a piece of iron refembling a mafon's fquare, and ending in a fork. The piece of iron *l* is a ring with a handle entering a little into the glafs-tube *m* filled with matiche, in the fame manner as does the iron-rod *n*. The conductor *po* is to be confidered as an additional piece to act in that marked *p*. There are likewife put iron-fpikes in *g*: the fupport *s* refembles thofe of *O* and *P* in the former figure. In this new machine you can lengthen or fhorten the horizontal conductor as you pleafe; and as the iron-ring *l* turns freely in a circular gorge made in the maff, the conductor is enabled to defcribe the entire area of a circle.

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Effects of
thefe in-
ftruments.

"The conftruction of this *electro-vegetometer* once well underftood, it will be eafy for us to conceive its effects. The electricity which prevails in the aerial regions will foon be drawn down by the elevated points of the upper extremity. This effect of the points is proved by the moft decifive experiments, and is called by philofophers the *power of the points*.

"The electric matter brought down by the point *E*, or by thofe marked *fff*, will be neceffarily tranfmitted both by the rod and chain; becaufe the infulation produced at the upper extremity of the maff completely prevents its communication with the timber. The electric fluid paffes from the chain to the horizontal conductor *K M* or *no*; it then efcares by the points at *P* and *g*; becaufe the fame points that have the power of bringing down the electric fluid, have likewife that of pushing it forward; a thing well known by experience.

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Method of
uſing them.

"The manner of uſing this inftrument is not more difficult than the knowledge either of its conductor or effects. Suppoſe, for example, we are to place it in the midft of a kitchen-garden. By making the horizontal conductor turn round fucceſſively, you will be able to carry the electricity over the whole ſurface of the propoſed ground. The electric fluid thus drawn down, will extend itſelf over all the plants you want to cultivate; and this at a time when there is little or no electricity in the lower regions nigh the ſurface of the earth.

"On the other hand, when it happens that the electric fluid ſhall be in too great abundance in the atmosphere, in order to take off the effect of the apparatus in *K* fig. 82. and in *n* fig. 83. you have only to hang to it an iron chain reaching to the ground, or elſe a perpendicular iron-rod, which will have the ſame effect. viz. that of deſtroying the infulation, and of infenſibly tranſmitting the electric fluid in the ſame proportion as it is drawn by the points; ſo that there ſhall never be an overcharge of this fluid in the inftrument, and its effect ſhall be either ſomething or nothing, according as you add or remove the ſecond chain or the additional rod.

"There will be nothing to fear from the ſpontaneous diſcharge of this apparatus, becauſe it is terminated

below by proper points in *P* and *g* of both machines; and it is a certain fact that a pointed conductor makes no exploſion, and that inftead of flaſhes there are only luminous ſtreams. However, it will be eafy to furniſh one, by means of which we may approach the apparatus with perfect ſecurity; it is only neceſſary to hold the hand before it. This has the form of a great *C*, and is of a height equal to the diſtance that takes place betwixt the horizontal conductor and the ſurface of the earth. This diſcharger near the middle muſt be furniſhed with a glafs-handle; and at that extremity which is directed towards the conductor, there muſt hang an iron-chain made to trail on the ground. This inftrument is an excellent ſafeguard. See fig. 84.

"By means of the *electro-vegetometer* juſt now deſcribed, one may be able to accumulate at pleaſure this wonderful fluid, however diffuſed in the regions above, and conduct it to the ſurface of the earth, in thoſe ſeaſons when it is either ſcantily ſupplied, or its quantity is insufficient for vegetation; or altho' it may be in ſome degree ſufficient, yet can never produce the effects of a multiplied and highly increased vegetation. So that by theſe means we ſhall have an excellent vegetable manure or nourishment brought down as it were from heaven, and that too at an eaſy expence; for after the conftruction of this inftrument, it will coſt you nothing to maintain it: It will be moreover the moſt efficacious you can employ, no other ſubſtance being ſo active, penetrating, or conducive to the germination, growth, multiplication, or reproduction of vegetables. This heavenly manure is that which nature employs over the whole habitable earth; not excepting even thoſe regions which are eſteemed barren, but which, however, are often fecundated by thoſe agents which nature knows ſo well to employ to the moſt uſeful purpoſes. Perhaps there was nothing wanting to bring to a completion the uſeful diſcoveries that have been made in electricity, but to ſhow this ſo advantageous art of employing electricity as a manure; conſequently, that all the effects which we have already mentioned, depend upon electricity alone; and laſtly, that all theſe effects, viz. acceleration in the germination, the growth, and production of leaves, flowers, fruit, and their multiplication, &c. will be produced, even at a time when ſecondary cauſes are againſt it: and all this is brought about by the electric fluid, which we have the art of accumulating over certain portions of the earth where we want to raiſe thoſe plants that are moſt calculated for our uſe. By multiplying theſe inftruments, which are provided at no expence (ſince iron-rods of the thickneſs of one's finger, and even leſs, are ſufficient for the purpoſe), we multiply their beneficial effects, and extend their uſe *ad infinitum*.

"This apparatus having been raiſed with care in the midſt of a garden, the happieſt effects were perceived, viz. different plants, herbs, and fruits, in greater forwardneſs than uſual, more multiplied, and of better quality. At the ſame time it was obſervable, that, during the night, the points *P* and *g*, as well as the upper extremities, were often garniſhed with beautiful luminous ſparks. Theſe facts are analogous to an obſervation which I have often made, viz. that plants grow beſt and are moſt vigorous near thunder-rods, where their ſituation favours their development. They ke-

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likewise serve to explain why vegetation is so vigorous in lofty forests, and where the trees raise their heads far from the surface of the earth, so that they seek, as it were, the electric fluid at a far greater height than plants less elevated; while the sharp extremities of their leaves, boughs, and branches, serve as so many points granted them by the munificent hand of nature, to draw down from the atmosphere that electric fluid, which is so powerful an agent in forwarding vegetation, and in promoting the different functions of plants.

"This electro-vegetometer may be set up not only in a kitchen-garden, but in an orchard, in a field of corn, olive-yard, &c. &c. Everywhere the same effects are produced, namely, fecundity in the soil, quickness of vegetation, increase of produce, superiority in the quality, &c. This machine is applicable to all kinds of vegetable productions, to all places, and all seasons; and if I am to believe the most enlightened and intelligent of my friends, the electro-vegetometer is one of the most noble and useful discoveries that have been made in the present century.

"Besides the advantages of the electro-vegetometer, of which we have been speaking above, there is still another very important one, namely, that by applying to it a large electrometer or grand conductor, we may thus find out the electricity of the atmosphere. For this purpose we must take away the points *HR* (fig. 82. and *r.* fig. 83.) which are seen in *RR*. This machine will likewise serve the purpose of a thunder-rod, if one takes care to thrust into the earth, to the depth of about 10 or 15 feet, a leaden tube, whose upper extremity may rise a few inches above the surface of the ground; and into this tube you are to pass the long iron chain or perpendicular rod set apart for destroying the insulation, and whose upper end is to be hooked to a chain in *H*, fig. 82. or in *k*, fig. 83. These two chains are very strong, and are fit for serving as an excellent conductor. Or if you choose, you may substitute in their room wets of white thread, or iron-wires, which will make no difference in the effects of the apparatus. In the figures we have preferred chains, that the distinction of the different parts may be the more sensibly perceived. With these additions the electro-vegetometer will be as good a thunder-rod as that any that are ordinarily constructed.

"It is not only by means of the electricity in the atmosphere, collected by the above apparatus, that one can supply the electric fluid, which is so necessary to vegetation; but the electricity named *artificial* answers the same purpose. However astonishing the idea may be, or however impossible it may appear to realize it, yet nothing will be found more easy upon trial. Let us suppose that one wants to augment the vegetation of trees in a garden, orchard, &c. without having recourse to the apparatus destined to pump down as it were the electricity from the atmosphere, it is sufficient to have a large insulating stool. This may be made in two ways; either by pouring a sufficient quantity of pitch and melted wax upon the above stool, whose borders being more raised than its middle, will form a kind of frame; or more simply, the stool (which is likewise called the *insulator*) shall only be composed of a plate longer than

broad, supported by four glass-pillars, like those used for electrical machines. One must take care to place above the insulator a wooden tray full of water, and to cause mount upon the stool a man carrying a small pump in the form of a syringe. If you establish a communication between the man and an electrical machine put in motion (which is easily done by means of a chain that connects with the conductor of the machine), then the man thus insulated (as well as every thing upon the stool) will be able, by pushing forward the sucker, to water the trees, by pouring upon them an electrical shower; and thus diffusing over all the vegetables under its influence a principle of fecundity that exerts itself in an extraordinary manner upon the whole vegetable economy: and this method has moreover this advantage, that at all times and in all places it may be practiced and applied to all plants whatever.

"Every one knows that the electricity is communicated to the water thus employed; and it would be easy to obtain the most ample conviction (if any one doubted it), by receiving upon his face or hand this electrical shower; he immediately feels small punctures or strokes, which are the effects of the sparks that issue from each drop of water. This is perceived most sensibly if there is presented a metal-dish to this electrical dew; for at the very instant of contact, brilliant flashes are produced.

"That the electricity received by the man from the chain may be communicated to the tray, we must put a small cake of white-iron, upon the end of which he may place his foot. The tray filled with water is a kind of magazine or reservoir to serve as a continual supply to the pump. After watering one tree, you transport the stool to a second, a third, and so on successively; which is done in a short time, and requires very little trouble.

"Instead of the chain, it is better to employ a cord or twist of pinchbeck or any other metal; by means of which there can be no loss of the electric matter, as there is in the case of the chain by the ring-points. Moreover, this metal cord or thread being capable of being untwisted and lengthened, there will be no occasion of transporting so often the electrical machine. It is almost needless to add, that this string or metallic chord, which is always insulated, may rest upon the same kind of supports with those which have been exhibited in *OP* and *s* of fig. 82. and 83. This method is simple, efficacious, and nowise expensive, and cannot be too much employed.

"If one wants to water either a parterre or common garden-beds and platforms of flowers, or any other plots in which are sown grain or plants of different ages and kinds, no method is more easy and expeditious than the following: Upon a small carriage with two wheels there is placed a framed insulator in form of a cake of pitch and rosin, as we have mentioned before in fig. 82. The carriage is drawn the whole length of the garden by a man or horse fixed to it. In proportion as you draw the carriage, the metallic cord winds itself upon a bobbin, which turns as usual. This last is insulated, either because the little apparatus that sustains the bobbin is planted in a mass of rosin (when you choose the axle to be of iron), or else because this

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The electricity of the air may be thus determined by a large electrometer.

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How to augment the powers of vegetation by artificial electricity.

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Easy method of applying electricity in this manner.

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tion.

this moveable axis is a tube of solid glass. There must also be a support, which serves to prevent the gold-thread or the metallic-cord from trailing on the ground, and thus dissipating the electricity; and, moreover, it serves as an insulator. To accomplish this last purpose, it is necessary that the ring into which it passes be of glass. One may likewise employ the insulators and supports marked *OP* and *s*, in fig. 82. and 83. If a gardener, mounted upon an insulator, holds in one hand a pump full of water, and with the other takes hold of a metallic-cord, in order to transmit the electricity which comes from the conductor; in this case, the water being electrified, you will have an electrical shower; which falling on the whole surface of the plants which you want to electrify, will render the vegetation more vigorous and more abundant. A second gardener is to give additional pumps full of water to him who is upon the insulator, when he shall have emptied those he holds; and thus in a little time you will be able to electrify the whole garden. This method takes hardly longer time than the ordinary one; and although it should be a little longer, the great advantages resulting from it will abundantly recompense the small additional trouble.

"By repeating this operation several days successive, either upon feed fown or plants in a state of growth, you will very soon reap the greatest advantages from it. This operation, equally easy with the preceding described upon the subject of watering trees, has been put in practice with the greatest success. Several other methods, answering the same purpose, might be devised; but they are all of them pretty similar to that just described.

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To electrify
water
kept in re-
servoirs,
&c.

"I cannot finish this article without mentioning another method relative to the present object, although it be much less efficacious than the preceding ones. It consists in communicating to water kept in basins, reservoirs, &c. (for the purpose of watering), the electric fluid, by means of a good electrical machine. To this end, one must plaster over with a bituminous cement all the interior surface of the basin destined to receive the water that serves for irrigation: the nature of this cement answering the purpose of insulation, will prevent the electric fluid that communicates with the water from being dissipated; and the water thus charged with electricity will be the more fitted for vegetation.

"The method just now laid down of electrifying water for the purpose of watering trees is both easy and cheap; the expence of the cement being inconsiderable, as it requires but once to be done, and as it prevents the water from filtrating and being lost, as well as from hurting the walls themselves, which would otherwise have occasion to be oftener repaired; consequently you are sufficiently indemnified by its utility for all the trouble you take. A machine applied to the extremity of the axle of the electric apparatus might communicate to it a rotatory movement, and still further diminish the expence of the operation.

245
Vegetables
injured by
the electric
shock.

"If the deficiency of the electric fluid, or rather a small quantity of it, is apt to be hurtful to vegetables, a too great abundance of this matter will likewise sometimes produce pernicious effects. The experiments made by Messrs Nairne, Banks, and other learn-

ed men of the Royal Society of London, prove sufficiently this truth. An electric battery, very strong, was discharged upon a branch of balsam still holding by its trunk. Some minutes after, there was observed a remarkable alteration in the branch, of which the less woody parts immediately withered, drooped towards the ground, died next day, and in a short time entirely dried up; at the same time that another branch of the same plant that had not been put under the electric chain, was not in the smallest degree affected.

"This experiment repeated upon other plants showed the same effects; and it was remarked that the attraction, occasioned by a strong discharge of the electricity, produced an alteration different according to the different nature of the plants. Those which are less woody, more herbaceous, more aqueous, experience in proportion impressions that are stronger and much more speedy in their operation.

"A branch of each of the following plants, composing an electrical chain, it was observed by these able philosophers, that the balsam was affected by the discharge of the battery in a few moments after, and perished next day. The leaves of a marvel of Peru did not drop till the day following that; and the same phenomenon happened to a geranium. Several days elapsed before there was observed any fatal effect on the cardinal flower. The branch of a laurel did not show any symptoms till after the lapse of about 15 days, after which it died; but it was a full month before they perceived any sensible change on the myrtle; at the same time they constantly observed that the bodies of those plants and branches which had formed no part of the chain, continued to be fresh, vigorous, and covered with leaves in good condition.

"It hardly ever happens that the superabundance of the electric fluid existing in a small portion of the atmosphere where a plant is situated, can be so great as that which took place by the explosion of the strong battery of Mr Nairne, directed particularly upon one branch; or if this should happen, it can only be upon a few individual plants in very small number; as when lightning falls upon a tree, breaks it, strips it of its mildew-sup-bark, or withers its leaves; or in the case of blasting or mildew in corn, which several farmers ascribe to the force of lightning. "This sentiment (says M. du Hamel) has acquired much probability since the discovery of the great effects of that electricity which is diffused so abundantly in the atmosphere when the weather is disposed to be stormy." (*Elements d'Agric. Tom. I. p. 346.*)

246
Blasting or
lightning
supposed to be,
owing to
lightning.

"It is not proposed here to prescribe the means of remedying the pernicious effects which may be produced upon this occasion; as there are none of them in circumstances exactly similar to that of the experiments of the philosopher just now quoted. But although this enormous excess of the electric fluid of which we have been speaking, never takes place through any great extent of space, nevertheless this excess, though even but inconsiderable, may be too great in several respects regarding the vegetable economy; and it is in this case that it is proper to seek the means of remedying it.

"Let us suppose that one has some plants or shrubs,
or

Effects of Electricity on Vegetation.

or some valuable trees or exotics that he wants to preserve, and is sensible that too great a quantity of electricity predominant in the atmosphere becomes hurtful to them, there are two methods that may serve to obviate the evil of which he is apprehensive. One is, to water plentifully these vegetables, so that their whole surface may be kept sufficiently wet; the consequence of which is, that the electricity prevailing in the atmosphere will be transmitted to the earth by the water adhering to the outside of the plants, as it is well known that water is an excellent conductor of the electric fluid: The other is, to place near these trees metallic points, which may be easily accomplished by simple lathes or wooden-poles; along which one must fasten by bandages plain iron-wires, so as to overtop them by some inches. These poles thus prepared, being thrust into the earth, will then draw down the electric fluid, and transmit it to the earth."

247 Methods of destroying insects by electricity.

Our author now proceeds to consider of methods of destroying the insects which frequently infest and destroy vegetables; which, he thinks, may be obtained by means of the electric fluid.

"Experience (says he) proves, that in years when vegetation is most vigorous and abundant, insects, if nothing opposes them, will then be most multiplied; and in fact they are sometimes so to an astonishing degree. How great mischief they produce on these occasions, every body knows, and as ardently desires to find a remedy for the calamity. The damage is indeed so considerable, that people imagine it is not possible by any means to put a stop to it; but I am of opinion, it is one of those evils to which electricity may be applied with effect.

248 Mischief done by caterpillars getting into the heart of twigs.

"It has been often remarked, that several species of worms or caterpillars are found in the heart of shoots, twigs, and even the trunks of trees, of shrubs, and of plants of different sorts. There are numbers, for example, in pear and other fruit trees. As soon as the animal has got to the inside of a branch, he forms a gallery according to the length of it: armed with strong scaly jaws, he soon reduces the woody substance to powder; and this same delicate caterpillar makes the wood, hard as it is, his favourite nourishment. Other insects generally show themselves in open day: but this one, like a pioneer, marches always in obscurity within; and we are apprised of his presence only by the mischief he produces, namely, by observing the tops of branches to wither, the leaves to fade and incline to the earth, and in fine the whole infected bough to decay and die away. In vain do you seek for this frail though terrible animal on the leaves; he enters the skin and penetrates the thickest bark of the surface; he goes even to the heart of the woody substance; and you can extirpate him only by cutting off the wood; and if this is a remedy, you must confess that it is at least equal to the mischief.

"This evil is much the more merits attention, that it extends itself particularly over a very great number of fruit-trees; in which, for the same reason, we are as particularly interested. Electricity, however, furnishes us with a remedy of the most efficacious sort to stop the progress of the evil, by attacking the enemy in his quarters, and destroying him in his own mine; which in this event is to become his tomb.

"The Leyden phial, by the mere force of its shock, which can be augmented gradually, is capable of destroying not only rabbits and pigeons, but bulls and oxen, especially when we employ electric batteries of great size, and containing a great number of electrified jars. Of consequence then it may be employed even with little apparatus to kill a tender and delicate caterpillar, which, in order to shelter itself from the impressions of the air, is obliged to keep perpetually shut up in the heart of trees, or in that of twigs, branches, or trunks themselves.

Effects of Electricity on Vegetation.

249 Easily killed by an electric shock.

"In order to succeed in killing these animals at the time when they begin to show their ravages, which mark likewise the place where the caterpillar is concealed, it is sufficient to make an electric chain with two plain iron-wires, and to place betwixt the two that part of the tree where it is supposed the insect resides. One need not be afraid of taking in even a larger space, for the experiment will succeed as well in a great extent as in a small; and besides, one runs no risk of missing the enemy he wants to combat. Let us suppose, that one be assured from the forementioned symptoms, that there is an insect in the tree; in this case you place iron-wires above and below the place where you suspect it to be lodged. Next, you must take care to make the one communicate with the exterior surface of an ordinary jar charged with electricity, and the other with the interior surface, which it is easy to do by bending these iron-wires so as to make them approach the electrical jar; then upon discharging this vessel where the electric fluid superabounds, the explosion is made to traverse the part where the animal lodges: the violence of the shock makes him die without recovery, and so destroys the evil in its source. If the ravage has not been carried to a high pitch, the tree recovers very soon, as I have often observed: but whatever be the result as to the re-establishment in certain circumstances, the evil proceeds no further; its progress stops; and it is always a great advantage to have arrested it in its march.

"Several experiments have convinced me of the success of this method. Upon cutting off several branches on which I discharged my jar or Leyden bottle, I constantly observed the animal dead; and you never fail of killing it when the distance betwixt the two extremities of the iron-wires is not too great, and when you take care to approach or remove them successively by repeating the shock several times.

"The bottle here employed cannot hurt the vegetable economy, because its dimensions are not too great, and no batteries are brought in play. The electric shock, given in certain bounds, is useful to animals; it therefore cannot be noxious to plants in the same circumstances.

"This operation is not tedious even when employed upon a great number of trees; but if one wants still further to abridge it, I here give him a method by which the experiment can be made in the same instant upon all the trees of an orchard, and will not be more tedious than if it were employed upon one tree only. You have only to provide a sufficient number of iron-wires, and to dispose them as was done for the first tree we spoke of just now, and in the same manner; by which means all these trees form an elec-

250 How to perform the operation on a great number of trees at once.

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Electricity
on Vegeta-
tion

trical chain, and the fluid in the explosion of the bottle will run over through the whole, supposing that you have discharged the bottle in the ordinary way, and at the same time taken care of what is very essential, that while the free extremity of the first wire touches the exterior surface of the electrical jar, the end of the other may communicate with the inside of the same charged phial.

251
How to de-
stroy a ca-
terpillar in
the root of
a tree.

"If the caterpillar be in the root, the operation is pretty much the same. By taking away, for an instant, a little earth, you easily put the affected roots within the chain: but if one is ignorant of the particular ramification of the root which is attacked, without uncovering the tree, you need only insert in the earth two wires opposite in their directions, and then perform the Leyden experiment, which is easily done. After having placed these two wires north and south, you may repeat the experiment by placing them east and west. You can hardly then miss the insect, especially if, in order to take in more space, you insert one of the wires farther than the other: for in this case the electric fluid will describe a diagonal, as we have already shown in regard to branches.

252
To prevent
these ani-
mals from
generating
in plants.

"This method serves not only to prevent the progress of the evil, but in some sense to anticipate it. In regard to these destructive insects there are epochs as for plants; both of them have marked times for their birth, their development, their growth, their multiplication, and that relative both to their genera and species. When the time is come that insects, caterpillars, and other animals attack plants, one must employ, by way of precaution, the method we have just now laid down; and by repeating the same from day to day for a certain space of time, we will at last succeed in preserving trees from the ravages of insects. The operation is neither tedious nor expensive; why then not have recourse to it for those curious and rare trees which come from afar at a great expence, and those valuable other trees that yield us yearly the most delicious fruits?

253
Advantages
to be ex-
pected from
this me-
thod.

"The method just mentioned is the most effectual that can be imagined, since it pursues the enemy to his most concealed corners in the inmost texture of the wood, and is capable of killing him in the very heart of trees, under the bark when he is to be found there, in the branches, and in the heart of the roots themselves: all which we have made appear in the foregoing remarks. I may further add, that there is no other remedy known but by electricity; for how is it possible to find out under the bark of a tree one or more insects that gnaw and destroy it? Must we not in this case strip the mentirely of their bark? and would not, therefore, the remedy be often worse than the disease? Besides, by what means could we penetrate into the heart of the tree? Would not the instrument employed to cut and lop it, rather add to the mischief, especially in the beginning of its progress? How again could we rummage to the inside of the roots? The tree thus uncovered, would it not suffer, especially in the great heats, when a perspiration more abundant must render necessary a nourishment, whose quantity ought at all times to be equal at least to the waste? Thus the celebrated Linnæus, struck with the calamities which

fruit-trees in particular suffer from insects and their caterpillars, cried out: "Who shall deliver us from this scourge?" *Quis possit liberare arbores fructiferas a larvis?"*

On this subject we cannot help observing, that there is some reason to suppose that the Abbe has over-rated the power of his remedy with regard to the destruction of insects. There is not the least doubt that an insect will be destroyed by finding a shock of electricity through its body; but while this insect is defended by the vegetable which it has pierced, and in which it lodges, the vegetable will also receive a very considerable part; and thus the insect may still escape, unless the shock be augmented to such a degree as to injure the vegetable also. His other experiments, it is said, have been confirmed by the observations of modern electricians.

SECT. XII. Effects of Electricity on Animals; of the Gymnotus, Torpedo, and other Electric Fishes; Medical Electricity.

SOON after the discovery of the electrical shock, and the method of augmenting the power of electricity, it naturally became an object with philosophers to investigate the effects of it upon animal bodies. These were quickly found to be entirely similar to such as are produced upon any other conducting substances, viz. an emission of sparks, attraction, and repulsion, &c. By degrees it was found, that very strong signs of electricity were exhibited by some animals, even without the application of any artificial apparatus. The experiment of producing sparks by stroking the back of a cat in frosty weather, readily showed that the electric fluid may exist in a very active state in the body of an animal without injuring any of its functions. From animals of the inferior kind a transition was made to the human species; and signs of electricity were discovered in them where it had not been suspected before. Some people have been remarkable for an extreme lustre of their eyes; and others have been so much electrified naturally, as to give evident signs of it when a sensible electrometer had been applied to them. Others have manifested an extreme sensibility of even the smallest degrees of electricity, in so much that they would be affected by a flash of lightning, though so remote that the thunder could not be heard. All this showed that the subtle fluid we treat of bears a very active part in the animal economy, and led to more important researches on the subject. One of the first discoveries was, that some creatures are so strongly electrified naturally as to have it in their power to give a strong shock at pleasure, capable of destroying any small animal that comes near them. Of these, however, only three, and those of the aquatic kind, have yet been observed, viz. the gymnotus electricus, the torpedo, and another called the *silurus electricus*.

The gymnotus* hath the astonishing property of giving the electric shock to any person, or number of persons, either by the immediate touch with the hand, or by the mediation of any metallic conductor; and a person who kept some of them told Dr Garden, that they had this property much stronger when first caught than afterwards.

254
Some ani-
mals natu-
rally elec-
trified.

* See the
article
Gymnotus.

Effects on
animals.255
Electrical
properties
of the gym-
notus.Effects on
Animals.

wards, "The person (says he) who is to receive the shock, must take the fish with both hands, at some considerable distance asunder, so as to form the communication, otherwise he will not receive it, at least I never saw any one shocked from taking hold of it with one hand only; though some have assured me, that they were shocked by laying one hand on it. I myself have taken hold of the largest with one hand often without ever receiving a shock; but I never touched it with both hands, at a little distance asunder, without feeling a smart shock. I have often remarked, that when it is taken hold of with one hand, and the other is put into the water over its body without touching it, the person received a smart shock; and I have observed the same effect follow when a number joined hands, the person at one extremity of the circle taking hold of or touching the fish, and the person at the other extremity putting his hand into the water over the body of the fish. The shock was communicated through the whole circle as smartly as if both the extreme persons had touched the fish. In this it seems to differ widely from the torpedo, or else we are much misinformed of the manner in which the numbing effect of that fish is communicated. The shock which the gymnotus gives seems to be wholly electrical; and all the phenomena or properties of it exactly resemble those of the electric *aura* of our atmosphere when collected, as far as they are discoverable from the several trials made on this fish. This stroke is communicated by the same conductors, and intercepted by the interposition of the same original electrics, or electrics *per se* as they used to be called. The keeper of this fish informs me, that he caught them in Surinam river, a great way up, beyond where the salt-water reaches; and that they are a fresh-water fish only. He says, that they are eaten, and by some people esteemed a great delicacy. They live on fish, worms, or any animal-food if it is cut small so that they can swallow it. When small fishes are thrown into the water, they first give them a shock, which kills or so stupifies them, that they can swallow them easily and without any trouble. If one of these small fishes, after it is shocked, and to all appearance dead, be taken out of the vessel where the electrical fish is, and put into fresh water, it will soon revive again. If a larger fish than they can swallow be thrown into the water, at a time that they are hungry, they give him some smart shocks till he is apparently dead, and then they try to swallow or suck him in; but, after several attempts, finding he is too large, they quit him. Upon the most careful inspection of such fish, I could never see any mark of teeth, or the least wound or scratch on them. When the electrical fish are hungry, they are pretty keen after their food; but they are soon satisfied, not being able to contain much at one time. An electrical fish of three feet and upwards in length cannot swallow a small fish above three or at most three inches and a half long. I am told, that some of these have been seen in Surinam river upwards of 12 feet long, whose stroke or shock proved instant death to any person that unluckily received it."

256
Some very
large ones
found in
Surinam
river.

Several other accounts of this fish have been published by different persons, but none of them so full and distinct as the above. They all agree that the

electric virtue of the fish is very strong. Mr Fermi, in his natural history of Surinam, published in 1765, tells us, that one cannot touch it with the hands, or even with a stick, without feeling a horrible numbness in the arms up to the shoulders; and he farther relates, that, making 14 persons grasp each other by the hands, while he grasped the hand of the last with one of his, and with the other touched the eel with a stick, the whole number felt so violent a shock, that he could not prevail on them to repeat the experiment. V. Vanderlott, in two letters from Rio Essequibo, dated in 1761, makes two species, the black and the reddish; though he acknowledges, that, excepting the difference of colour and degree of strength, they are not materially different. In most experiments with these animals, he remarked a surprising resemblance between them and an electrical apparatus: nay, he observed, that the shock could be given to the finger of a person held at some distance from the bubble of air formed by the fish when he comes to the surface of the water to breathe; and he concluded, that at such times the electrical matter was discharged from his lungs. He mentions another characterizing circumstance, which is, that though metals in general were conductors of its electric property, yet some were found to be sensibly better than others for that purpose. Of this property Dr Priestley takes notice, and says, that a gold ring is preferable to any thing else. The same is likewise observed by Linnæus. Dr Priestley adds, that the sensation is strongest when the fish is in motion, and is transmitted to a great distance; so that if persons in a ship happen to dip their fingers or feet in the sea, when the fish is swimming at the distance of 15 feet from them, they are affected by it. He also tells us, that the gymnotus itself, notwithstanding all its electric powers, is killed by the lobster.

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Remarks
concerning
the difference
of the power of
conducting
this shock.

The surprising property of the torpedo* in giving a violent shock to the person who takes it in his hands, or who treads upon it, was long an object of wonder. For some time it was in general reckoned to be entirely fabulous; but at last the matter of fact being ascertained beyond a doubt, philosophers endeavoured to find out the cause. M. Reaumur resolved it into the action of a vast number of minute muscles, which by their accumulated force gave a sudden and violent stroke to the person who touched it. But solutions of this kind were quite unsatisfactory, because the stroke was found to be communicated through water, iron, wood, &c. When the phenomena of electricity began to be better known, it was then suspected that the shock of the torpedo was occasioned by a certain action of the electric fluid; but as not the least spark of fire, or noise, could ever be perceived, this too seemed insufficient. Of late, however, Mr Walth has, by indefatigable pains, not only explained this surprising phenomenon on the known principles of electricity, but given a demonstration of his being in the right, by constructing an artificial torpedo, by which a shock resembling that of the natural one can be given.

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Artificial
torpedo
species.
259
Artificial
torpedo
by Mr
Walth.

The electric organs of the torpedo consist of two sets of very small cylinders lying under the skin, one of which is electrified positively and the other negatively,

Effects on
Animals.

tively, seemingly at the pleasure of the fish. When a communication is made between the set of cylinders positively electrified and those which are negatively so, a discharge and shock ensue, like what happens in the case of the Leyden phial. The only difficulty now is to account for the total absence of a spark (which in the case of the torpedo never exists even in the smallest degree), and the impossibility of conducting the shock through the smallest interval of air. But this also is explained in a satisfactory manner by Mr Walsh, and shown to be nothing else than what every day takes place in our electrical experiments. It is well known, that a small charge of electricity, if put into a little phial, will occasion a bright spark and loud noise when discharged: but if the same charge is put into a phial much larger, the spark and noise will be less in proportion; neither will the spark break through near such a space of air in the latter case as in the former; though the shock would in both cases be the same to a person who received it through his body. If, instead of a large phial, we suppose the charge to be diffused all over a large battery, the shock would still be the same, and yet the spark and noise attending it would be almost imperceptible. The case is just the same with the torpedo. Each of the electric organs is a battery composed of innumerable small cylinders, which discharging themselves all at once produce a formidable shock; but by reason of the smallness of the charge of each, the spark is imperceptible, and cannot break through the least space of air. The truth of this was exemplified in Mr Walsh's artificial torpedo, which though it would give a very considerable shock through a conductor totally uninterrupted, yet on the least breach therein, even for the breadth of a hair, no shock was felt.

In every other respect the electricity of the torpedo agrees with that exhibited by the common electrical machines. An insulated person cannot receive a shock by touching one of the electric organs of the fish; but a violent stroke is given to the person, whether insulated or not, who lays one hand on the positive and the other on the negative organ. The fish, as is reasonable to imagine, seems to have this electric property in its own power; and appears sensible of his giving the shock, which is accompanied by a kind of winking of his eyes.

261
Of the filu-
rous electric
cus.

The third fish which is known to have the power of giving the shock, is found in the rivers of Africa, but we have a very imperfect account of its properties (o). This animal belongs to the order called in Willoughby's system *filurus*; hence it is commonly called *filurus electricus*. Some of those fishes have been seen even above 20 inches long. The body of the *filurus electricus* is oblong, smooth, and without scales; being rather large, and flattened towards its anterior part. The eyes are of a middle size, and are covered by the skin which envelops the whole head. Each jaw is armed with a great number of small teeth. About the mouth it has six filamentous appendices, viz. four from the under lip and two from the upper; the two external ones, or farthest from the mouth on the under lip, are the longest. The co-

lour of the body is greyish, and towards the tail it has some blackish spots. The electric organ seems to be towards the tail, where the skin is thicker than on the rest of the body; and a whitish fibrous substance, which is probably the electric organ, has been distinguished under it. It is said that the *filurus electricus* has the property of giving a shock or numbing sensation like the torpedo, and that this shock is communicated through substances that are conductors of electricity; but no other particular about it is known with any considerable degree of certainty.

An inquisitive mind will immediately ask, for what purpose has nature furnished those animals with so singular a property? But the present knowledge of the subject seems to furnish no other answer, except that they are endowed with the power of giving the shock for the sake of securing their prey, by which they must subsist, and perhaps of repelling larger animals which might otherwise annoy them.

The ancients considered the shocks given by the torpedo as capable of curing various disorders; and a modern philosopher will hardly hesitate to believe their assertions, after that electricity has been found to be a remedy for many diseases.

Besides these animals which manifest their electric power evidently by giving a strong shock, there are others in which the fluid seems to act by the emission of light. This indeed has not been proved by actual experiment, tho' it would certainly be well worth while to try whether by insulating a number of them, any more evident signs of electricity could be obtained. These creatures are of the insect tribe; some of them furnished with wings, as the shining flies in the warm countries; while others, as the glow-worm, crawl perpetually on the earth. It is most probable also, that the sparkling of sea-water is owing to the electricity of the insects which occasion it. Be this as it will, however, from the instances already adduced, it is certain that the electric fluid pervades at all times the whole body of every animal; whence, by exciting or diminishing its action, it is reasonable to suppose that many important changes might be made in the human body, and hence the foundation of *Medical Electricity*.

Though the effects of this fluid as a remedy for diseases fall particularly to be mentioned under the article *Medicine*, we cannot help here taking notice, that a very strange uncertainty remains concerning what we should imagine to be its first and most obvious effects; namely, whether simple electrification has any effect in quickening and augmenting the pulse? This was laid to be the case by the first electricians, but denied by their successors; and even when the great machine at Haarlem is made use of, it still remains doubtful whether there be any effect of this kind or not.

The shock of the Leyden phial having been found effectual in removing some complaints, the use of it was introduced into the common practice of medicine; and is still continued, though a more gentle method of using the fluid is now generally preferred. The apparatus for the medical electrician, besides the machine already described, consists of the following parts. 1. An

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Apparatus
for apply-
ing it for
the purpose of me-
dicine.

(o) Messrs Adanson and Forskal make a short mention of it, and M. Broussonet describes it under the French name of *le Trembleur* in the *Hist. de l'Academie Royale des Sciences* for the year 1782.

Medical Electricity.

Medical Electricity.

insulating stool with glass feet, or, what is much better, an arm chair, well rounded at the edges of the wooden parts, and fixed on a large stool with glass feet, which should be at least nine or ten inches in length; for the longer the feet are, the better will the insulation be. The inside part of the back of the chair should move on an hinge, that it may occasionally be let down to the stool, and so the back of the patient be electrified more conveniently; the arms of the chair should be made longer than ordinary. 2. A Leyden bottle with a discharging electrometer. 3. A pair of directors of considerable size, with glass handles and wooden points. 4. A large metallic ball of brass or copper, with a metallic handle to receive the sparks. The ball should be unfretted, and the wire long and sharp pointed to receive the stream of electric fire. 5. A few glass tubes of different bores, some of them with capillary points. 6. Several yards of brass wire or chain; or, which is much better, several lengths of wires with loops at the end; the part of the wire between these being covered with some non-conducting substance, as a silk ribbon, &c.

Plate CLXXV.

The directors are represented by fig. 29. the handles being of glass, one of them having a ball on its end represented by *A*; the other is without the ball, having its wire bent for the convenience of conducting the electric stream on the eye, &c. Either of the balls may be unfretted from the wires, and the wooden point *B* screwed in its place, or the pointed end of the brass wire used. The glass handles should be held as far from the brass work as possible. To convey the electric fluid to the ear or throat, glass tubes with sliding brass wires through them should be made use of, such as are represented in fig. 30.

Fig. 31, 32. represent the electric forceps, which is thought by some electricians to be more convenient for giving the shock than the directors. Fig. 33. is the medical jar, with an electrometer, that regulates the strength of the shock, and enables the operator to give a succession of them of nearly equal force. On the upper part of a bent piece of glass *C* is cemented a brass socket *D*, which is fastened to a spring tube *E*; a wire *F* moves in this tube, so that the ball *G* may be set at any required distance from the ball *H*. The end *I* of the bent piece of glass is also cemented to a spring tube, which slides upon the wire *K*, communicating with the inside of the jar.

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How to give a shock to a particular part of the body

To use this medical jar, the ball *H* must be placed in contact with the conductor of the electrical machine, or at least be connected with it by a wire; after which it is to be charged in the usual manner. If a wire proceeds from the ball *L* to the outside coating, the jar will be immediately discharged, as the accumulation of the electric fluid is sufficiently powerful to pass through the space of air between the two balls: hence a shock may be communicated to the arm by means of the wires and directors as in the figure, and it will be stronger in proportion as the distance of the ball *G* from *H* is augmented. This electrometer acts in the manner of the common discharging rod, and therefore has received the name of the *discharging electrometer*.

Plate CLXXIII.

In fig. 6. we have a representation of Mr Lane's electrometer applied to the machine for medical elec-

tricity. *G*, the lower part of which is inclosed in the pillar *F*, is made of wood baked and boiled in linseed-oil, and bored cylindrically for two-thirds of its length. The brass work is fixed to the pillar by the screw *H*, and is moveable in the groove *I*, so that it may be raised higher or lower as the height of the jar *D* requires. A steel screw *L* passes through the brass work, having its threads about $\frac{1}{4}$ th of an inch distant from one another. To the end of this, and opposite to *K*, is fixed a hemispherical and well polished piece of brass; and a brass ball *M*, likewise well polished, is fixed to the prime conductor. To this screw is annexed a circular plate *O*, divided into 12 equal parts; and in every revolution of this screw pointing to the divisions of the scale *N*, each of which are equal to one turn of the screw. The use of this electrometer is to discharge the jar *D*, or any battery connected with the prime conductor, when the machine is not applied to medical purposes. If a person holds a wire fastened to the screw *H* in one hand, and another wire (fixed to *E* by a loop of brass) passing from the frame of the machine to a tin-plate on which the jar *D* stands, or the hook *E* connected with it, he will perceive no shock when *K* and *M* are in contact; and the degree of explosion, as well as the quantity of electricity accumulated in the jar, will be regulated by the distance of *K* and *M* from each other.

The improved way of applying the discharging electrometer to the conductor, is found to be much more convenient and ready than any other; as it has also the advantage of being useful to a jar or battery of any size. See fig. 6. where *aA* represents the electrometer as applied to the conductor; *cd* the improved medical jar suspended at a small distance from it. A small glass tube *ef* is fixed in this jar, a part of the lower end of which is coated. Two wires pass through the brass ball *C* on the top of this tube; one of which is connected with the bottom of the jar, and the other goes only to the internal coating of the small tube. The wires are moveable at pleasure, and the jar is suspended from the conductor by a brass ring; and a chain or wire must be fixed to the hook *d* at the bottom. From a bare inspection of the figure, it appears that the arm will receive the shock by the discharge of the jar *acd*; for, by turning the cylinder round, the jar soon becomes charged either with one or both wires in it; and directly as the charge becomes sufficiently strong to pass thro' the air, it will explode, and the fluid pass to the end of *b* next to it, going through the wire to the wrist, and from thence up to the other chain at the shoulder. By reversing the positions or the connections of the two wires, the progress of the shocks will be reversed, viz. from the shoulder to the wrist. If the short wire alone be left in the jar *cd*, and the discharging ball of the electrometer *abc* be placed from a quarter of an inch to a whole one from the conductor, a most delicate small shock may be given, and repeated any number of times at pleasure. This is called the *electrical vibrating shock*.

Fig. 31. *g* represents the bottle director. It is hollow, and coated like a common jar, acting as such, and in some cases is looked upon as convenient. With this, as with the common director, it is proper to press the ends against the part where the shock is to be applied.

Fig. 32.

Fig 56. represents a small pocket electrical apparatus, which may sometimes be of use for medical purposes as well as others. It is packed up in a very small size, being only five inches long, two broad, and one deep. It is capable of a tolerable strong charge or accumulation of electricity, and will give a small shock to one, two, three, or a greater number of persons.

A is the Leyden phial or jar that holds the charge; *B* is the discharger to discharge the jar when required without electrifying the person that holds it; *C* is a silk ribbon prepared by a coating of varnish, so as to be excited, and communicate its electricity to the jar; *D* are two hair, &c. skin rubbers, which are to be placed on the first and middle fingers of the left hand, and serve to excite the ribbon *C*.

To charge the jar. Place the two finger-caps *D* on the first and middle finger of the left hand; hold the jar *A* at the same time at the joining of the red and black *B* on the outside between the thumb and first finger of the same hand; then take the ribbon in your right hand, and steadily and gently draw it upwards between the two rubbers *D*, on the two fingers, taking care at the same time the brass ball of the jar is kept nearly close to the ribbon while it is passing through the fingers. By repeating this operation 12 or 14 times the electrical fire will pass into the jar, which will become charged; and by placing the discharger *C* against it, as in the plate, you will see a sensible spark pass from the ball of the jar to that of the discharger. If the apparatus is dry and in good order, you will hear the crackling of the fire when the ribbon is passing through the fingers, and the jar will discharge at some distance.

To electrify a person. You must desire him to take the jar in one hand, and with the other touch the knob of it: or, if diversion is intended, desire the person to smell at the knob *A* of it, in expectation of smelling the scent of a rose or a pink: this last mode has occasioned to be sometimes called the *magic smelling bottle*.

The following are the principal methods by which electricity may be applied to the human body with a medical view.

1. *By merely placing the patient in an insulated chair, and connecting him with the prime conductor.*—When the machine is in action, he will thus be filled with the electric fluid, which will be continually dissipated from the points and edges of his clothes: and though the effects of this are probably too slow to be rendered very advantageous, yet a sedentary person might perhaps derive some benefit from sitting in an insulated chair, having before him an insulated table, the chair to be connected with the ball of a large charged jar or battery; by which means a small quantity of the fluid will be continually passing through those innumerable capillary vessels, on the right state of which our health so much depends.

2. *By throwing the fluid upon, or extracting it from a patient, by means of a wooden point.*—This may be effected in a twofold manner: 1st, By insulating the patient, and connecting him either with the cushion or the positive prime conductor, the operator presenting the point. 2^d, Let the patient stand upon the ground, and the wire of the director be connected either with the positive or negative parts of the machine. The

sensation produced by the fluid when acting in this manner is mild and pleasing, resembling the soft breezes of a gentle wind; generating a genial warmth, and promoting the secretion and dissipation of tumors, inflammations, &c.

3. *By the electric friction.*—Cover the part to be rubbed with woollen cloth or flannel. The patient may be seated in an insulated chair, and rubbed with the ball of a director that is in contact with the conductor; or he may be connected with the conductor, and rubbed with a brass ball which communicates with the ground. The friction thus produced is evidently more penetrating, more active, and more powerful, than that which is communicated by the flesh brush; and there is very little fear of being thought too sanguine. This, when used but for a few minutes, will be found more efficacious than the other after several hours application. — Electricity applies here with peculiar propriety to spasm, pleurisy, and some stages of the palsy; and in every case answers the end of blistering where the discharge is not wanted, being the most safe and powerful stimulant we know.

4. *By taking strong sparks from the patient.* Here, as in every other case, the operator may connect the ball of the director with the positive or negative conductor, or he may connect the patient with either of these and the ball with the ground. Now it is clear from what has been already laid down, that if the director be connected with the positive conductor, the fluid is thrown upon the patient, if with the cushion the fluid is extracted from him. Let the patient be insulated, and the action is in some measure reversed; if he is joined to the negative conductor or cushion, he will receive a spark from a person standing on the floor; but if he communicates with the positive conductor, he will give the spark to the person on the ground.

5. *By causing a current of the electric fluid to pass from one part of the body, and thus confining and concentrating its operation without communicating the shock.* Place the patient in an insulated chair, and touch one part of the body with a director, joined to a positive conductor; then with a brass-ball communicating with the ground touch another part; and when the machine is in action the fluid will pass through the required part from the conductor to the ball; the force of the stream will be different according to the strength of the machine, &c. Or connect one director with the cushion and the other with the positive conductor, and apply these to the part through which the fluid is to pass, and when the machine is in action the electricity will pass from one ball to the other. It is not necessary to insulate the patient in this case.

6. *By the shock.* Which may be given to any part of the human body, by introducing that part of the body into the circuit which is made between the outside and inside of the bottle. This is conveniently effected, by connecting one director by a piece of wire with the electrometer and the other with the outside of the bottle; then hold the directors by their glass-handles, and apply the balls of them to the extremity of the parts through which the shocks are to be passed. The force of the shock, as we have already observed, is augmented or diminished by increasing or lessening the distance

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between the two balls, which must be regulated by the operator to the strength and sensibility of the patient. Instead of the common bottle, we may have a small one with a glass tube proceeding from it, through which proceeds a wire and look to hang it upon the machine, with a longer one from the outside coating, and which is to be carried by means of a director to the patient. When this is used as a common bottle, both wires are to be left there, and the shock is communicated by two directors, one connected with the bottom, the other with the top. The operator will often find himself embarrassed in giving small shocks, the fluid passing from the conductor to the ball of the electrometer, instead of going through the circuits he desires: when this happens, which may be known by the chattering noise of the spark, the resistance forced to the discharge is so great, that the fluid cannot force its way through the circuit: to remedy this, pass two metallic pins through the clothing, so that they may be in contact with the skin, which will lessen the resistance and conduct the fluid.

7. *By a sensation between a shock and the spark, which does not communicate that disagreeable feeling attending the common shock.* This is effected by taking out the long wire from the small medical bottle, and leaving the shorter one which is connected with the tube in its place, the directors to be connected and used as before. The effect of this species of shock, if it may be called one, is to produce a great vibration in the muscular fibres, without inducing that pungent sensation which the shock effects. It is therefore applicable to some stages of palsy and rheumatism; it may also serve as an artificial means of exercise.

8. *By the bottle-director.* Insulate the patient, and place one of the balls in contact with him; by which means this director is charged. Now if a wire is conveyed from the bottom of this to the top of another director, the bottle-director will be discharged whenever the other ball *b* is brought in contact with the patient; so that by bringing it down with rapidity, any number of small shocks may be procured in a minute: or connect the insulated patient with the top or inside of a large charged jar, and then this apparatus used in the foregoing manner will discharge from the large jar at each spark its own contents, and by repetition discharge the whole jar: thus a number of shocks may be given without continually turning the machine or employing an assistant.

9. *By passing the whole fluid contained in the Leyden phial through a diseased part without giving the shock.* Connect a director, by means of a wire, with the ball of a Leyden jar; charge the jar either completely or partially, and then apply the ball or point of the conductor to the part intended to be electrified, and the fluid which was condensed in the phial will be thrown on the part in a dense slow stream, attended with a pungent sensation which produces a considerable degree of warmth. If a wire that communicates with the ground is placed opposite to the end of the director, the passage of the fluid will be rendered more rapid, and the sensation stronger. Or insulate the patient, connect him with the top of a jar, charge this, and then apply a metal wire or piece of wood to the part thro' which you mean to make the fluid pass. It is obvi-

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ous, that in this case the circuit between the inside and the outside of the jar is not completed, therefore the shock will not be felt. The condensed fluid passes in a dense slow stream through the required part, while the outside acquires a sufficient quantity from substances near it to restore the equilibrium.

It is in all cases most advisable to begin with the more gentle operations, and proceed gradually to increase the force as the strength and constitution of the patient or the nature of the disorder requires. The stream from a wooden point, a wooden ball, or brass point, may be first used; sparks, if necessary, may then be taken, or small shocks given.

In rheumatic cases the electric friction is generally used. If the pains are local, small shocks may be given. To relieve the toothache, very small shocks may be passed through the tooth; or, cover the part affected with flannel, and rub it with a director communicating with the machine.

In inflammatory and other disorders of the eyes, the fluid should be thrown from a wooden point: the sensation here produced is that of a gentle cooling wind; but, at the same time, it generates a genial warmth in the part affected.

In palsies, the electric friction and small shocks are administered. Streams of the fluid should always be made to pass through the affected part.

The only treatise we have yet had from the faculty on the subject of medical electricity is a pamphlet, intitled, *Considerations on the Efficacy of Electricity in removing Female Obstructions*, by Mr Birch; and if its merits were to be confined to this disease alone (in which it may be reckoned a specific), it would be intitled to the attention of practitioners; but we have reason to expect much more from it, since the prejudices of the faculty seem removed, and the practice is becoming more general every day.

SECT. XIII. *Of the Uses of the Electric Fluid in the System of Nature at large.*

THESE are so many and so various, that it may be said without much exaggeration, that whether we look to the heaven above or to the earth beneath, we can scarce perceive any thing, that is not acted upon, and in a manner perfectly subjected to the operations of this wonderful fluid. If we attend to the common phenomena of our atmosphere, experiments show that electricity is connected with every one of them. If we evaporate water by means of heat, it appears from the experiments of M. Saussure, related n^o 201. et seq. that a strong electricity is produced. If vapour is condensed into rain, a quantity of electricity is also produced; and if water is frozen into ice, if it descends in hail or snow, electricity appears to be equally concerned. When clouds emit their electricity in great quantities, they instantly dissolve in rain; which is more or less heavy according to the quantity of electricity discharged, as in thunder storms; and when this quantity is excessive, a vast many discharges are frequently made before the rain can descend. Hence it is reasonable to conclude, that though heat may be the cause of the first rise of vapour, it is the electric fluid which unites it with the air in such a manner as to

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Electricity
concerned
in the pro-
cess of
hail, snow,
&c.

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System of
Nature

be perfectly dissolved and become transparent in it (p). This is confirmed by an observation related under the article *CLOUD*; namely, that small clouds floating in the atmosphere will frequently be seen to attract one another, and so meet together; after which, if they have been of nearly an equal size, both will almost instantly vanish. Transparency itself, as we have seen in many instances through the course of this treatise, depends on the vibratory motion of the electric fluid; and when we are assured that it depends on this in several cases, we may conclude from analogy that it does so in all. In the case of vapour dissolved in the atmosphere, therefore, as long as this particular motion continues through it, the vapour remains dissolved and transparent; but when the electricity comes to be disposed to assume the other motion, of which it is exceedingly susceptible, *viz.* that of running in a stream from one place to another, the vibratory motion ceases, the vapour formerly dissolved loses its transparency, and appears in the form in which it was originally raised by heat, *viz.* that of an opaque smoke or mist. As this mist must always be electrified (for it is in the disposition of the fluid to fly to a distant place that electricity consists), the fluid then begins to exert its power of attraction, and the mist collects in bodies larger or smaller according to the quantity of motion with which the electric matter is affected: and thus we see how by means of this disposition of the fluid, cloudy weather, rain, or the most violent thunderstorms, may be produced.

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It regulates
the heat of
the different
climates.

On looking farther into the operations of nature, we find the electric fluid acting in a still higher capacity, and regulating the temperature of the different climates throughout the world. Under the article *CHEMISTRY*, n° 99, it has been shown, that what is heat in summer becomes electric fluid in winter; and under the article *COLD*, it has been shown that cold as well as heat is a positive substance. In the present treatise it has been proved at length, that the electric fluid and the light of the sun are the same; the former being in truth no other than the solar light absorbed by the earth, entangled among its particles, becoming subject to new laws, and acting in many cases as if it were a distinct fluid. Hence it becomes a proper antagonist to the light itself: for as the latter is only the fluid of electricity moving in a vibratory manner, and what we call electricity is the same fluid either in a comparatively stagnant situation, or disposed to run with violence from one place to another; it is plain that the motion of the light must be opposed by the fluid tho' stagnant, and much more if it be moving in any opposite manner. But the action of light when augmented is heat: the power which opposes it therefore, *i. e.* the electric fluid moving in an opposite direction, as explained under *CHEMISTRY*, n° 102, is cold itself; and hence the strong electric appearances in the atmosphere in cold countries, or in cold weather even in our own country. Hence also the electricity of the

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serene sky is weaker in summer than in winter; and the combustion, which is a very strong vibratory action of the electric matter, produces no electricity, the one action being inconsistent with the other. The electric fluid therefore regulates the light and heat of the sun throughout the whole world, and is itself regulated by them; so that neither heat nor cold can ultimately predominate any where.

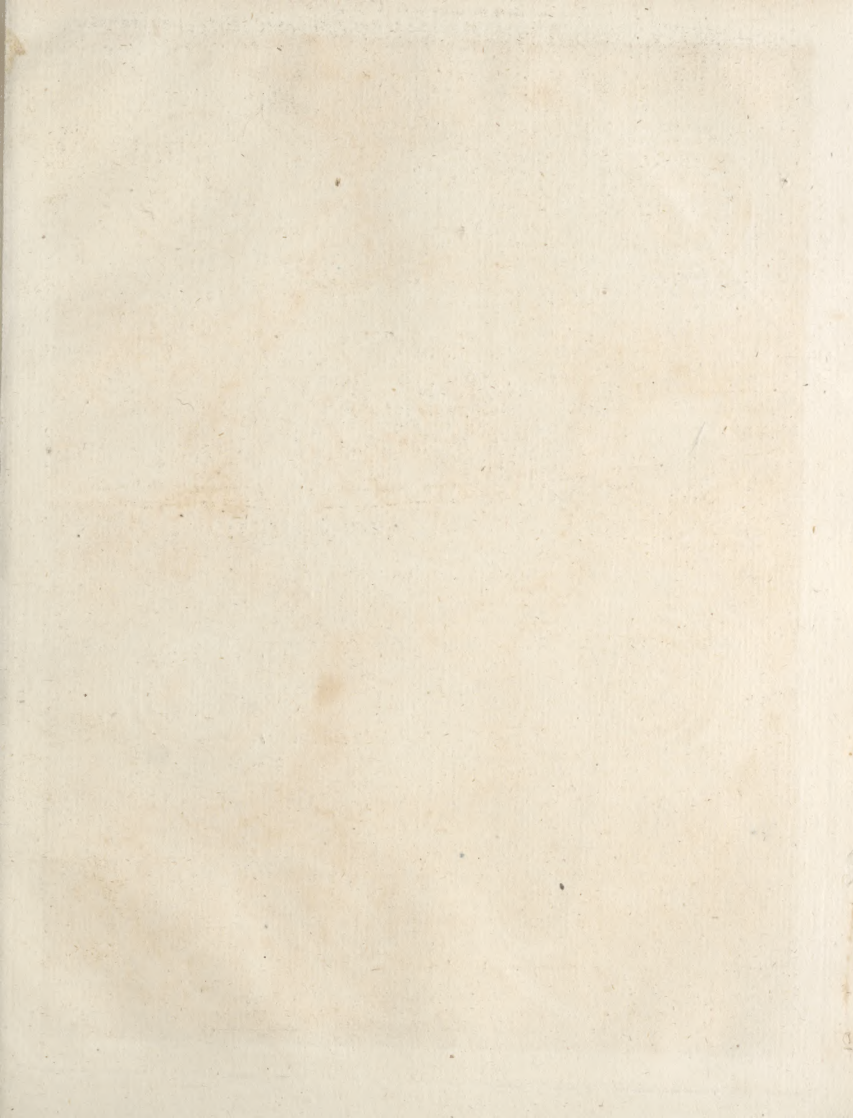
Descending from the atmosphere into the earth itself, we find the electric matter no less concerned there than in the atmosphere. It has been already observed, that its vibratory motion probably gives transparency to all bodies. Sometimes this motion is augmented to a great degree, as in the waters of the ocean, which become unusually clear before tempests and hurricanes. Its action in producing earthquakes is explained at large under the article *EARTHQUAKE*, as well as in setting fire to volcanoes under the article *VOLCANO*. Like other fluids, its action seems to gain a great increase of power when it runs for a considerable way along any conductor. This may be easily conceived from the consideration, that the substance along which it runs is every where pressed by a fluid of the same kind, which continually accelerates its motions, and at last gives them an intensity capable of acting as the most vehement fire. The fact has been long observed, and is confirmed by the experiments of Mr Wilson in the Pantheon as well as by those of later electricians. In the former, the spark taken from a vault conductor of 155 feet in length, was so strong that it resembled the discharge of a large jar, or rather a small battery; and was so very pungent, that few who had tried it once would venture on a second experiment. The latest experiments were made with a number of tin conductors joined to each other ends: in which situation it was found that the spark taken from them was much stronger than when they were laid at each others sides, though the surface was in both cases exactly the same. Hence we see, that if by any means the electric fluid shall meet with an unusually good conductor for a considerable way through the earth, the extremity of that conducting part may be heated, set on fire, or violent explosions issue from it; and the same thing will take place in the atmosphere. Upon this principle then may we account for natural hot-baths; explosions suddenly issuing from the earth, by which people have sometimes been killed; clouds and whirlwinds charged with an enormous quantity of electricity, and far beyond what in the ordinary way they could contain, &c.

Thus, to the action of the electric fluid we are in an especial manner to ascribe the temperature of the air throughout the whole globe; all the phenomena of rain, snow, hail, lightning, tempests, and in all probability the currents of the air itself named winds. Certain it is at least, that every electrified substance has an atmosphere round it resembling a gentle blast

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Ads in
many various
ways in the
substance of
the earth
of itself.

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Almost all
general
phenomena
to be ascribed to it.

(P) In this there appears some inaccuracy of expression: but as it is somewhat difficult to find terms at once sufficiently accurate and intelligible, we shall bear observe, that by the word *heat* we mean the electric or universal fluid moving in a certain manner, *viz.* from a centre to a circumference; by *cold*, the same fluid pressing from a circumference to a centre; by the electric fluid simply, the same either comparatively stagnant, or moving in any other way than those just mentioned.





Uses in the of cool air; and it is also very remarkable, that the electric fluid itself cannot be blown away from any substance, even by the most violent blast of air we can imagine. An undoubted evidence of this is, that if you set up a small ball or pointed body upon the conductor of a strong machine, so that a stream of electric light may issue from it, it will not be in your power to turn this flame aside in the smallest degree by the most violent blast of a bellows. On the contrary, if any body is presented to it which has a tendency to attract, the flame will move across the blast of air directly contrary to it, or in the same direction with it, in the very same manner as if no such thing was present. As the electric fluid therefore acts independent of the air, and cannot have its motions controlled by it, it is highly probable that all the motions of the atmosphere are controlled by this fluid alone: and indeed if we allow it to be the proper antagonist to the light of the sun itself, we must readily allow it also to be the regulator of every other power on this earth.

Its effects on vegetation have been treated of in the last section, though we cannot certainly say that it is the original cause of this process. It seems, however, to be the true cause of CRYSTALLIZATION; which, as remarked under that article, probably is only an incipient or imperfect vegetation. The most convincing proof of this is from the experiments of Mr Lichtenberg with a large electrophorus; in which the knob of an electrified phial being drawn over the surface of the electric plate, finely powdered rosin afterwards sifted upon the place assumed the figure of stars and other beautiful ramifications, indicating not only an inclination to arrange itself in the same regular order with the crystals of salts, but to run out into branches like those of vegetables. These experiments have been repeated to great advantage by the Reverend Mr Bennet, according to whose method the figures represented in Plate CLXXIX were made. The apparatus used for making them consisted only of a common Leyden phial, and a plate of glass 15 inches square covered on one side with a varnish of gum lac dissolved in spirit of wine (q), and several times laid over. The other side is covered with tin-foil laid on with common paste. When it is to be used, the glass-plate is put upon a metallic stand with the tin-foiled side laid undermost; the phial is to be charged, and the knob drawn over the varnished side. Thus any kind of figure may be drawn or letters made as represented in the plate; and from every figure beautiful ramifications will proceed, longer or shorter according to the strength of the charge. On some occasions, however, the charge may be too strong, particularly where we wish to represent letters, so that the whole will be blended into one confused mass. The round figures are formed by placing metallic rings or plates upon the electrical plate; and then giving them a spark from the electrified bottle, or sending a shock through them. The figures may be rendered permanent by blowing off the loose chalk, and clapping on a piece of black-sized paper upon them; or if they are wanted of another colour, they may easily be obtained by means of lake, vermilion,

rose-pink, or any of the ordinary colours ground very fine. The easiest way of applying them seems to be by a barber's puff-bellows.

This tendency of the electrical fluid to produce ramifications in its passage through other substances, is likewise evident from the figure of the positive flames described by Mr Nicholson, and represented Plate CLXXVIII. It may indeed be objected, that in both cases the fluid has to make its way thro' non-conducting substances, where it meets with a considerable resistance; so that the case cannot be applicable to vegetation, where a ready conductor is always found in the moisture with which the earth abounds. But if we consider that the earth, and every thing contained in it, is already saturated with electric matter, it must readily appear that no new quantity can be forced into it without meeting with a considerable resistance; and therefore it will branch out and divaricate in the very same manner when passing through the earth, that it does when artificially sent through the air, or made to diffuse itself on the surface of an electric substance. If in the earth it meets with such particles as serve to facilitate its passage, these will be arranged according to the direction of the fluid itself; and thus these particles being consolidated by other powers, or by electricity itself acting in a different manner, may be supposed to assume the figures of branched roots; while the continual accumulation of new matter augments them in bulk, and is what we call the growth of the plant, or its drawing nourishment from the ground. It is not indeed pretended that we can explain the manner in which plants grow; the utmost we can do is to attain some slight and general idea of the cause, and how by the action of that cause, directing itself according to the laws given it by the Author of nature, the effects may be produced. This is sufficient to satisfy the curiosity natural to the human mind: a farther knowledge would not only be entirely useless, but in all probability is inconsistent with the limited state of our faculties at present. What is here said concerning vegetation, may be applied equally to the formation and growth of animal bodies; but this subject is still more obscure and difficult: it has been supposed by many, however, that the nervous fluid is the same with that of electricity; for which many probable reasons might be assigned, though the subtilty and invisibility of both must for ever prevent us from obtaining any direct proof on this subject.

When we consider the rest of the terrestrial phenomena, we find the same fluid concerned in every one of them, or rather acting as their only cause. There is, and not in nature a more surprising phenomenon than that of the magnet; and this, by repeated experiments, has been proved to depend on electricity. Magnetical kind. needles have often been endowed with their virtue by means of artificial electricity, and iron has been known to receive it from lightning; whence we may reasonably conclude, that the power of the magnet at all times depends upon the secret operation of the electric fluid. By extending its power to the production of attractive and repulsive forces in all cases, and which from many

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Curious figures made by it means on a varnished plate of glass.

Uses in the System of Nature.

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(q) Two ounces of shell-lac powdered and mixed with six ounces of spirit of wine answers very well for this purpose. The glass must be warmed, and the varnish spread upon it with a camel's hair pencil. Care must be taken, however, not to lay it on too thick, otherwise the effect will not follow.

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Système of
Nature.

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Count Tres-
san's system
of natural
philosophy.

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Methods of
imitating
the planeta-
ry motions.

natural phenomena is extremely probable, we shall fill give it a higher rank in the système of nature. We shall now find it guiding the planets in their courses through the heavens, giving stability and cohesion not only to terrestrial substances, but to the globe of earth itself, and to all other bodies in the universe.

A système of natural philosophy on this principle was begun in the year 1747, and lately published by the Count de Tressan. In this the electric fluid is considered as the first principle of motion in the universe, and the immediate agent by which the système of nature is governed. According to him, the fixed stars themselves are no other than as many foci of action communicating electricity to their surrounding planets, which have electric atmospheres of different extents. He shows the operation of the fluid in all the different phenomena of earth, air, water, fire, &c. descending even to the most minute, as well as considering the most grand and sublime, exhibitions of nature. That the electric fluid is capable of imitating many of these phenomena, is certain; as for example, those of earthquakes, water-spouts, tides, &c. of which an account is given under their proper articles. By means of the same fluid also we may imitate the planetary motions; and for this several contrivances have been fallen upon: the principal are as follow.

1. From the prime conductor of an electric machine suspend six concentric hoops of metal at different distances from one another, in such a manner as to represent in some measure the proportional distances of the planets. Under these, and at the distance of about half an inch, placé a metallic plate, and upon this plate, within each of the hoops, a glass-bubble blown very thin and light. On electrifying the hoops, the bubbles will be immediately attracted by them, and will continue to move round the hoops as long as the electrification continues. If the electricity is very strong, the bubbles will frequently be driven off, run hither and thither on the plate, making a variety of surprising motions round their axis; after which they will return to the hoop, and circulate as before; and if the room is darkened, they will all appear beautifully illuminated with electric light.

2. Provide a ball of cork about three quarters of an inch in diameter, hollowed out in the internal part by cutting it in two hemispheres, scooping out the inside, and then joining them together with paste. Having attached this to a silk thread between three and four feet in length, suspend it in such a manner that it may just touch the knob of an electric jar, the outside of which communicates with the ground. On the first contact it will be repelled to a considerable distance, and after making several vibrations will remain stationary; but if a candle is placed at some distance behind it, so that the ball may be between it and the bottle, the ball will instantly begin to move, and will turn round the knob of the jar, moving in a kind of ellipsis as long as there is any electricity in the bottle. This experiment is very striking, tho' the motions are far from being regular; but it is remarkable that they always affect the elliptical rather than the circular form.

3. Cut a piece of India paper in the shape of an isosceles triangle, whose sides are about two inches long, and two-tenths of an inch in breadth; then erect a brass ball of two or three inches dia-

meter on a brass wire one-sixth of an inch in thickness, and two feet six inches long, on the prime conductor: electrify the conductor, and then bring the obtuse end of the piece of paper within the atmosphere of the ball; let it go, and it will revolve round the ball, turning often round its own axis at the same time.

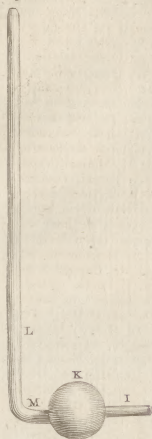
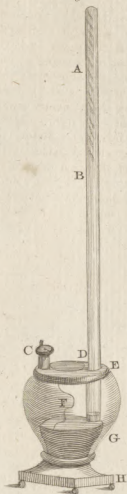
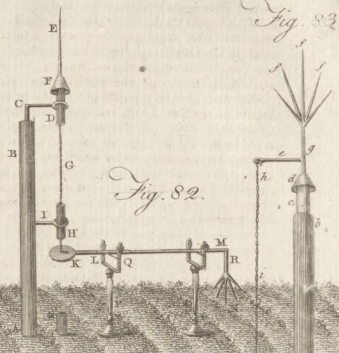
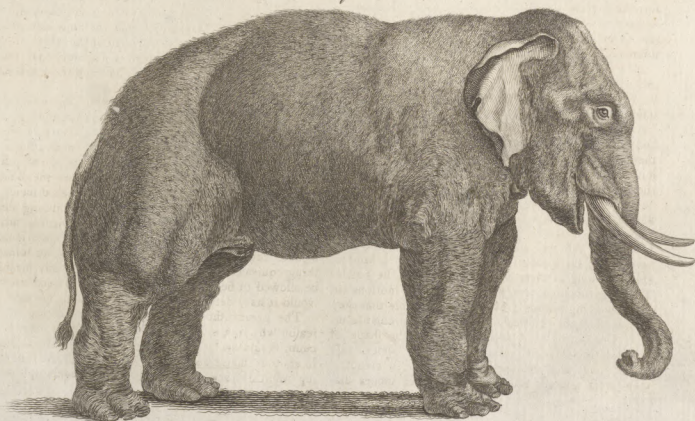
We shall not here enter into any speculations concerning the way in which it might be supposed possible to produce the planetary motions by means of the efflux of the sun's light, and the return of the electric fluid towards him. Before we can make excursions into these celestial spaces, it is absolutely necessary to remove an objection derived from Mr Morgan's experiment, that the electric fluid cannot pervade a perfect vacuum; and from which he concludes, that the electric fluid cannot pass beyond the limits of our atmosphere. On this experiment, however, we must observe, that though it were really proved in a much more decisive manner than is done by this experiment, that the fluid cannot be artificially driven through a vacuum, this would not prove that it cannot naturally pass through it, unless we should suppose the powers of nature and of art to be equal to one another. But that even the powers of art, in Mr Morgan's experiment, have not a fair chance of success, is evident from an inspection of fig. 80. Here he endeavours to force the electric fluid through a long course of perfect vacuum, and finds the power of his machine insufficient for the purpose. Yet one of Mr Morgan's own experiments might have led him to vary this one in such a manner as would perhaps have shown the possibility of transmitting the fluid through the most perfect vacuum that can be made. He informs us, that a spark, which in the open air cannot exceed one quarter of an inch diameter, will appear to fill the whole of an exhausted receiver four inches wide and eight inches long; tho' in the latter case it will be excessively faint in comparison with what it would have been in the atmosphere: yet, in order to prove that the faintness of the electric light *in vacuo* depends on the enlarged space through which it is diffused, we have only to introduce two pointed wires into the vacuum, so that the fluid may pass from the point of the one to the point of the other; and when the distance between them is not more than the tenth of an inch, in this case we shall find the spark as bright as in the open air.

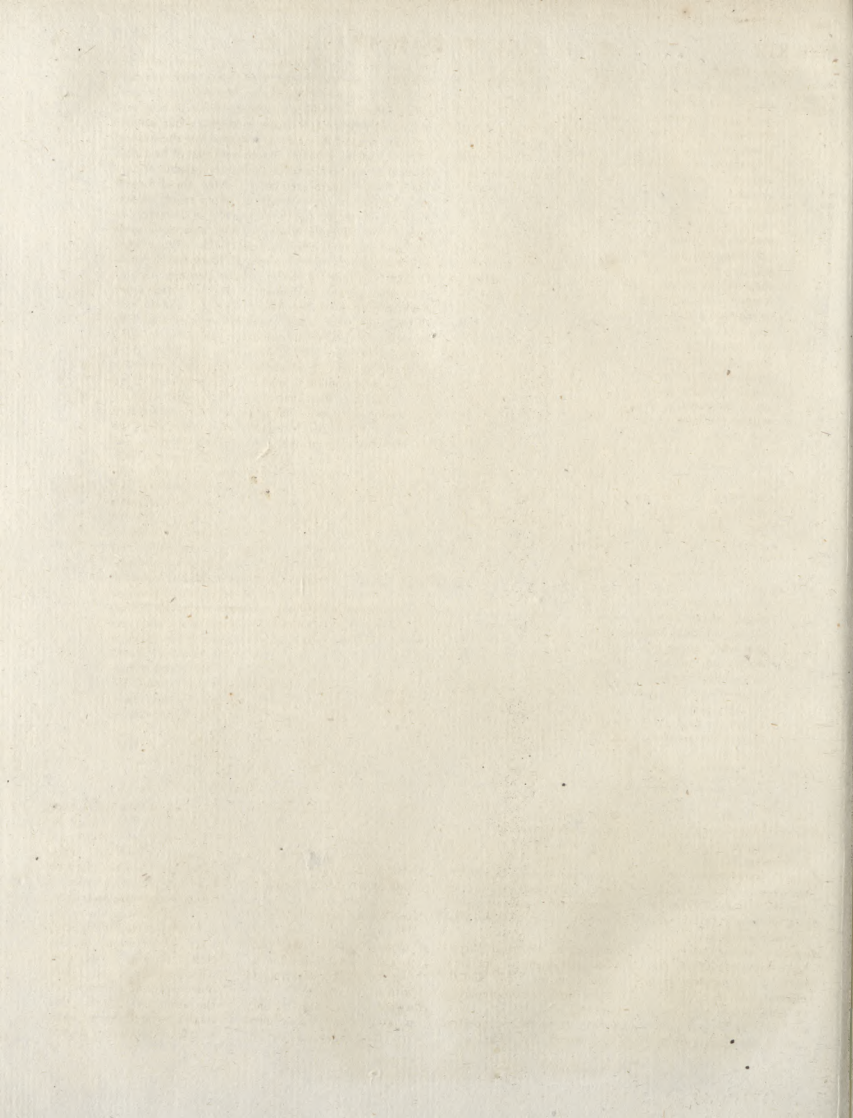
The inference to be derived from this experiment is obvious. Had Mr Morgan, instead of attempting to cause the fluid pass through the whole length of the vacuum, put two wires in the inside at a small distance from each other, as described in the experiment just now mentioned, it is very probable that the fluid would have made its way through that small distance. It must be acknowledged indeed, that, considering the very great difficulty of making this experiment at any rate, we could scarce expect that this additional trouble could be taken: but without this, or something equivalent, his conclusion cannot by any means be allowed to be just; nor, even if it had been tried, would it have determined the question in his favour.

The great difficulty in this experiment is to give a reason why in a certain degree of exhaustion the vacuum should be so easily penetrated by the fluid, and in another should make such resistance; but the following considerations will probably throw some light on this

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Fig. 81.*Fig. 80.**Fig. 86.**Fig. 85.**Fig. 82.**Fig. 83.**Elephas.*



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this subject. 1. In all cases where the fluid is obliged to pervade the substance of any medium whatever, it moves with difficulty. Thus, if a vast quantity of electricity is sent through a small wire, the resistance it meets with is so great that the wire is dispersed with violence; and if the battery is large, it cannot be totally discharged, as was the case with Dr Van Marum's battery, mentioned n^o 150. Again, if the spark be taken in water, a most violent explosion takes place; and yet both metals and water are good conductors of electricity. 2. In all cases where we set the electric fluid in motion, the utmost we can do is to give it a tendency to circulate; and unless we allow it to do so, no electricity will be produced. Thus, if we extricate the fluid from the earth by means of an electrical machine, discharge it upon a conductor, and form a communication between that and another part of the earth, the circulation will go on very readily, and the fluid will easily return to the place from whence it came. If the communication betwixt the earth and conductor be cut off by an electric, the circulation will nevertheless go on; the fluid will evaporate in the air, and from thence reach the earth by channels invisible to us. The effect will be the same in all cases where its motion in a certain direction is stopped: but what we call *stopping* it, is only rendering its passage more difficult in one particular place than in another; for as to any absolute stop or impediment, such as could resist the whole force of the fluid, as Mr Morgan supposes, there is not the least probability that it exists in nature. The whole that can be inferred from Mr Morgan's experiment therefore is, that the electric fluid will more readily evaporate and pass silently thro' the air than through a complete vacuum. The question, however, still recurs: Since this fluid passes very readily through rarefied air, why does it hesitate after a certain degree of rarefaction, and at last stop altogether when the air is totally exhausted? To this it may be replied, that when air is heated it becomes less electric than when cold, and by an increase of heat becomes at last an excellent conductor. On the other hand, by an increase of cold its electric properties become proportionably greater, and consequently the difficulty with which the fluid gets through it increases in proportion. Under the article *ELASTIC Vapours*, it is shown that

the true principle of elasticity is *heat*; and under the article *CHEMISTRY*, n^o 99. it is shown, that heat and electricity are convertible into one another. In proportion as the air is rarefied, therefore, it absorbs heat, and consequently becomes a better conductor; but when it is totally exhausted, nothing remains but the fluid of electricity itself; the same indeed with that of heat, but deprived of motion, and consequently capable of making a much greater resistance. Now the strongest spark that can be drawn from any of our machines perhaps does not equal $\frac{1}{100}$ th of an inch in diameter, as appears from the holes made by them in paper or cards when pierced, as directed in SECT. VIII. But when a perfect vacuum is made, this small spark is obliged to act upon a cylinder of electric matter perhaps 6000 or 7000 times greater in diameter than itself, each point of which resists with the whole force the explosion itself has; and what is worse, the whole of this must be put in motion before any discharge can be made. The resistance therefore is so violent, that the fluid rather passes through the air as already explained: nevertheless, if it were possible to make a perfect vacuum of no greater diameter than that of the electric spark, there is no reason to suppose that it would not be penetrated by it; and of this Mr Morgan's experiments with the two wires above mentioned seems to be a confirmation.

On the whole, it is evident, that we cannot from this or indeed any other experiment argue against the possibility of the passage of the electric fluid from any part of the creation to another. We cannot force it, it is true, because it is disposed by its own natural laws to resist our efforts; but where it is disposed by these laws to yield in one place, there will undoubtedly be a current of it thither from some other, which we would find ourselves equally unable to stop by all the machines that ever have been or will be invented. There is as yet therefore not the least proof that the electric fluid does not pervade the most distant regions of space, and there perform all those great operations which have been ascribed to unknown and inexplicable powers. For a further account of the operations of this fluid in producing the phenomena of nature, see the articles *ATMOSPHERE*, *AURORA Borealis*, *EARTHQUAKE*, *HAIL*, *HURRICANE*, *LIGHTNING*, *METEOR*, *RAIN*, *SNOW*, &c.

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Electricides
||
Electuary.

ELE

ELECTRIDES, anciently islands in the Adriatic sea, which received their name from the quantity of amber (*electrum*) which they produced. They were at the mouth of the Po, according to Apollonius of Rhodes, but some historians doubt of their existence.

ELECTROMETER. See *ELECTRICITY*, n° 27.

ELECTROPHORUS. *Ibid.* n° 16.

ELECTRUM, in natural history. See **AMBER**.

ELECTUARY, in pharmacy, a form of medicine composed of powders and other ingredients, incorporated with some conserve, honey, or syrup; to be divided into doses, like boluses, when taken.

Vossius observes, that all the remedies prescribed for the sick, as well as the confections taken by way of regale, were called by the Greeks $\alpha\lambda\epsilon\iota\tau\eta\rho\alpha\tau\alpha$ and $\epsilon\lambda\epsilon\kappa\tau\eta\rho\alpha$, of the verb $\epsilon\lambda\epsilon\kappa\tau\omega$, "I lick;" whence, says he, was formed

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ELE

ed the Latin *electarium*, and afterwards *electuarium*. This conjecture he supports from the laws of Sicily, where it is ordained, that *electuaries*, syrups, and other remedies, be prepared after the legal manner. The Bollandists, who relate this etymology, seem to confirm it. For the composition and different sorts of electuaries, see **PHARMACY**.

ELEEMOSYNA *Carucarum*, or *pro Aratri*, or *Aratri*, in our ancient customs, a penny which king Ethelred ordered to be paid for every plough in England towards the support of the poor. Sometimes it is also called *eleemosyna regis*, because first appointed by the king.

ELEEMOSYNARIUS, in our old writers, is used for the almoner or peculiar officer who received the eleemosynary rents and gifts, and distributed them

Eleemosy-
na,
Eleemosy-
narius.

Elegance
Elements.

to pious and charitable uses. There was such an officer in all religious houses. The bishops also used to have their almoners, as now the king has.

ELEGANCE, (from *eligo* "I choose,") denotes a manner of doing or saying things politely, agreeably, and with choice. With choice, so as to rise above the common manners; politely, so as to strike people of delicate taste; and agreeably, so as to diffuse a relish which gratifies every body.

ELEGANCE, in oratory and composition, an ornament of politeness and agreeableness shown in any discourse, with such a choice of rich and happy expressions, as to rise politely above the common manners, so as to strike people of a delicate taste.

It is observed, that elegance, though irregular, is preferable to regularity without elegance: that is, by being so scrupulous of grammatical construction, we lose certain licences wherein the elegance of language consists.

ELEGIAC, in ancient poetry, any thing belonging to elegy. See ELEGY.

ELEGIT, in law, a writ of execution, which lies for a person who has recovered debt or damages; or upon a recognizance in any court, against a defendant that is not able to satisfy the same in his goods.

ELEGY, a mournful and plaintive kind of poem. See the article POETRY.

ELEMENTS, in physics, the first principles of which all bodies in the system of nature are composed.

These are supposed to be few in number, unchangeable, and by their combinations to produce that extensive variety of objects to be met with in the works of nature.

That there is in reality some foundation for this doctrine of elementary bodies is plain; for there are some principles evidently exempted from every change or decay, and which can be mixed or changed into different forms of matter. A person who surveys the works of nature in an inattentive manner, may perhaps form a contrary opinion, when he considers the numerous tribes of fossils, plants, and animals, with the wonderful variety that appears among them in almost every instance. He may from thence be induced to conclude, that nature employs a vast variety of materials in producing such prodigious diversity. But let him inquire into the origin of this apparent diversity, and he will find that these bodies which seem the most different from each other are at bottom nearly the same. Thus the blood, chyle, milk, urine, &c. as well as the various solid parts of animals, are all composed of one particular substance; grass, for instance, by the assistance of air and water, and even sometimes of very insipid kinds of grass. The same simplicity presents itself in the original composition of the nourishment of vegetables, notwithstanding the variety among them with respect to hardness, softness, elasticity, taste, odour, and medical qualities. They chiefly depend, for these, upon water and the light of the sun; and the same simplicity must take place in animals that are fed on vegetables. The analysis of animal substances confirm this hypothesis; for they can all be reduced into a few principles, which are the same in all, and only differ with regard to the proportions in which they are combined. With regard to animals, the case

appears to be the same: and the more we are acquainted with them, the more reason we have to believe that the variety in their origin is very small.

Notwithstanding the infinite variety of natural productions, therefore, it appears, that the materials employed in their production are but few; that these are uniformly and certainly the same, totally exempted from any change or decay; and that the constant and gradual change of one body into another is produced by the various separations and combinations of the original and elementary parts, which is plain from the regularity and uniformity of nature at all times. There is a change of forms and combinations through which it passes, and this has been the case from the earliest accounts of time; the productions of nature have always been of the same kind, and succeeded one another in the same order. If we examine an oak, for instance, we find it composed of the same matter with that of any other that has existed from the earliest ages. This regularity and uniformity in the course of nature shows that the elementary parts of bodies are permanent and unchangeable; for if these elementary particles which constituted an oak some thousand years ago, had been undergoing any gradual decay, the oaks of the present times would have been found considerably different from those that existed long ago; but as no difference has been observed, it would seem that the ultimate elements of bodies have always continued the same.

Reflections of this kind have suggested an idea of several principal elements of which all other bodies are composed, which by their various combinations furnished all the variety of natural bodies. Democritus, and other great philosophers of antiquity, fixed the number to four, which have retained the name of elements ever since. These are, fire, air, earth, and water; each of which they imagined was naturally disposed to hold its own place in the universe. Thus, the earth, as heaviest, naturally tended towards the centre, and occupied the lower parts; the water, as approaching next to it in gravity, was spread chiefly on the outside of the earth; the air, being more subtle and rare, occupied the middle place; while the fire, being still more subtle and active, receded to the greatest distance of all, and was supposed to compose the planets and stars. This system was extended to all the productions of nature. Meteors were produced from a combination of fire and air; animals were considered as composed of earth and water; and those that were warm had likewise a proportion of the element of fire. Thus they went on, explaining some of the most striking qualities of the several productions of nature from the different proportions of the four elements they contained.

But though this system appears not at all destitute of beauty and propriety; and on this account has been in some measure received even to the present time, we find reason to doubt whether these four substances be really elementary bodies; nor do they answer our purpose in forming a system, as we know too little of the intimate structure and texture of them to enable us to explain other bodies by them.

Any other attempts that have been made to assign the number of elementary bodies have been much less fortunate. The chemists, with Paracelsus at their head, pretend

Elements.

Elements.

pretend to speak of four elementary bodies, salt, sulphur, earth, and mercury: but when we attempt to form an idea of what they mean, we find it very perplexed; and that the expressions concerning them are enveloped in so much obscurity, that they cannot be comprehended; and the theory is built entirely upon experiments made on metallic substances.

Under the article CHEMISTRY, n° 26. we have shown, that the elements, whatever they are, must necessarily be invisible or imperceptible by any of our senses. An inquiry into their number or properties therefore must be attended with very little success; and all the knowledge we can have upon the subject must be drawn from a view of their combinations, and reasoning analogically from the transmutations we observe to take place in nature. The modern discoveries in aerology have enabled us to proceed farther in this way than what it was possible for the ancient philosophers to do. We now find that all the different kinds of air are composed of that invisible and subtle fluid named *heat*, united in a certain way with some other substance: by which union the compound acquires the properties of gravitation, expansion, rarefaction, &c. for pure heat, unless united with some terrestrial substance, neither gravitates nor expands. This is evident from the phenomena of the burning-plas, where the light concentrated in the focus will neither heat the air nor water, unless it meets with something with which it can form a permanent union. Heat therefore is justly to be considered as one of the original elements; being always capable of uniting with bodies, and of being extricated from them unchanged; while the same bodies are by their union with it changed into various forms; water, for instance, into ice or vapour, both of which return into their original state by the abstraction or addition of heat in a certain degree. Hence it becomes almost natural to conclude, that there are only two elements in the universe; and this opinion we find adopted by several philosophers, particularly the Count de Tressan in his Essay on the Electric Fluid. According to this doctrine, two primitive material substances seem to exist in nature; one that incessantly acts, and to which it is essential to be in motion; the other absolutely passive, and whose nature it is to be inert, and move entirely as directed by the former. Should this doctrine be adopted, little difficulty would occur in determining the active matter to be that universal fluid which in its various modifications of light, heat, and electricity, has such a share in the operations of nature. But in fixing on the passive element we are greatly embarrassed; nor are the discoveries in aerology or any other science as yet able to remove the difficulty entirely. In our experiments on this and some other parts of chemistry, we find three things that seem to be unchangeable, viz. earth; phlogiston; and that invisible, though terrestrial and gravitating principle called by the antiphlogistians the *oxygenous* or acidifying principle, and by the phlogistians the basis of dephlogisticated air. In our experiments on the first, we find that earth, though vitrified by the most intense fire, may be recovered in its proper form; and some very pure earths, particularly magnesia alba, cannot be changed even in the focus of the most powerful mirror. In like manner we may dissipate charcoal *in vacuo* by the solar rays, and the compound is inflammable air: we may decompose

this compound by a metallic calx, and we have our Elements. charcoal again unchanged, for all metals contain charcoal in substance. Let us try to destroy it by common fire, and we have it then in the fixed air produced, from which it may be recovered unchanged by means of the electric spark. With the basis of dephlogisticated air the case is still more difficult; for we cannot by any means procure a light of it by itself. We may combine it with heat, and we have dephlogisticated air; to the compound we may add charcoal, and we have fixed air; by decomposing the former by burning iron in it, we have the metal greatly increased in weight by some unknown substance; and if we attempt to separate the latter, we have water, or some kind of vapour, which still conceals it from our view.

In some experiments made by Mr Watt, and of which an account is given under the article ACID, n° 12. we find that nitrous acid might be phlogisticated by the purest earth or metallic calx; whence it is not unreasonable to suppose that phlogiston may be only a certain modification of earth, and not an element distinct from it: but with regard to the basis of dephlogisticated air, no experiment has ever shown that it can either be procured by itself, or changed into any other substance; so that it appears to have the nature of an element as much as light or heat. Though we should therefore be inclined to divide the whole matter of the universe into two classes, the one active and the other acted upon, we must allow that the passive matter even on this earth is not precisely of the same kind: much less are we to extend our speculations in this respect to the celestial regions; for who can determine whether the substance of the moon is the same with that of our earth, or that the elements of Jupiter are the same with those of Saturn? There is even a difficulty with regard to the division which seems so well established, viz. of matter in general into active and passive; for no person can prove, that the matter which is active in one case may not be passive in another, and occasionally refuse its activity. Something like this certainly happens in the case of the electric fluid, which is modified into heat or light, according to different circumstances; and we cannot know but it is the very same substance that constitutes the most solid bodies. This opinion at least did not seem absurd to Sir Isaac Newton, who proposed it as a query, Whether gross bodies and light were not convertible into one another? The end of our inquiries on this subject therefore must be, That the universe may be composed of many elements, or of one element; and of the nature of these elements, or of the single one, we know nothing.

ELEMENT, in a figurative sense, is used for the principles and foundations of any art or science; as Euclid's Elements, &c.

ELEMENTS, in astronomy, are those principles deduced from astronomical observations and calculations, and those fundamental numbers which are employed in the construction of tables of the planetary motions. Thus, the elements of the theory of the sun, or rather of the earth, are his mean motion and eccentricity, and the motion of the aphelia. The elements of the theory of the moon are its mean motion; that of its node and apogee, its eccentricity, the inclination of its orbit to the plane of the ecliptic, &c.

Elemi
Elephantia.

ELEMI, or ELEMV, in the materia medica. See AMYRIS.

ELENCHUS, in antiquity, a kind of ear-rings set with large pearls.

ELENCHUS, in logic, by the Latins called *argumentum* and *inquisitio*, is a vicious or fallacious argument, which deceives under the appearance of a truth; the same with what is otherwise called *sophism*.

ELEPHANT, in zoology. See ELEPHAS.

American ELEPHANT: An animal only known in a fossil state, and that but partially, from the teeth, some of the jaw-bones, the thigh-bones, and vertebrae, found with many others five or six feet beneath the surface on the banks of the Ohio. But these bones differ in several respects from those of the elephant; for which, see *Fossil Bones*. As yet the living animal has evaded our search. Mr Pennant thinks it "more than probable, that it still exists in some of those remote parts of the vast new continent unpenetrated yet by Europeans. Providence maintains and continues every created species; and we have as much assurance that no race of animals will any more cease while the earth remains, than *seed-time and harvest, cold and heat, summer and winter, day or night*. See MAMMUTH.

ELEPHANT-Beetle. See SCARABÆUS.

Knights of the ELEPHANT, an order of knighthood in Denmark, conferred upon none but persons of the first quality and merit. It is also called the *order of St Mary*. Its institution is said to have been owing to a gentleman among the Danish croises having killed an elephant, in an expedition against the Saracens, in 1184; in memory of which, king Canutus instituted this order, the badge of which is a towered elephant, with an image of the holy virgin encircled with rays, and hung on a watered sky-coloured ribbon, like the George in England.

ELEPHANTA, a small, but very remarkable island about five miles from the castle of Bombay in the East Indies. Of this we have the following description in Mr Grose's Voyage to the East Indies. "It can at most be but about three miles in compass, and consists of almost all hill: at the foot of which, as you land, you see, just above the shore, on your right, an elephant, coarsely cut out in stone, of the natural bigness, and at some little distance not impossible to be taken for a real elephant, from the stone being naturally of the colour of that beast. It stands on a platform of stones of the same colour. On the back of this elephant was placed, standing, another young one, appearing to have been all of the same stone, but has been long broken down. Of the meaning, or history, of this image, there is no tradition old enough to give any account. Returning then to the foot of the hill, you ascend an easy flant, which about half way up the hill brings you to the opening or portal of a large cavern hewn out of a solid rock, into a magnificent temple: for such surely it may be termed, considering the immense workmanship of such an excavation; and seems to me a far more bold attempt than that of the pyramids of Egypt. There is a fair entrance into this subterranean temple, which is an oblong square, in length about 80 or 90 feet, by 40 broad. The roof is nothing but the rock cut flat at top, and in which I could not discern any thing that did not show it to be all of one piece. It is about 10 feet high, and supported towards the middle, at equidistance from the

sides and from one another, with two regular rows of Elephantia pillars of a singular order. They are very massive, short in proportion to their thickness, and their capital bears some resemblance to a round cushion pressed by the superincumbent mountain, with which they are also of one piece. At the further end of this temple are three gigantic figures; the face of one of them is at least five feet in length, and of a proportionable breadth. But these representations have no reference or connection, either to any known history or the mythology of the Gentoos. They had continued in a tolerable state of preservation and wholeness, considering the remoteness of their antiquity, until the arrival of the Portuguese, who made themselves masters of the place; and in the blind fury of their bigotry, not suffering any idols but their own, they must have even been at some pains to maim and deface them, as they now remain, considering the hardness of the stone. It is said they even brought field-pieces to the demolition of images, which so greatly deserved to be spared for the unequalled curiosity of them. Of this Queen Catherine of Portugal was, it seems, so sensible, that she could not conceive that any traveller would return from that side of India without visiting the wonders of this cavern; of which too the sight appeared to me to exceed all the descriptions I had heard of them. About two-thirds of the way up this temple, on each side, and fronting each other, are two doors or outlets into smaller grots or excavations, and freely open to the air. Near and about the door-way, on the right-hand, are several mutilated images, single and in groupes. In one of the last, I remarked a kind of resemblance to the story of Solomon dividing the child, there standing a figure with a drawn sword, holding in one hand an infant with the head downwards, which it appears in act to cleave through the middle. The outlet of the other on the left hand is into an area of about 20 feet in length and 12 in breadth; at the upper end of which, as you turn to the right, presents itself a colonnade covered at top, of 10 or 12 feet deep, and in length answering to the breadth of the area: this joins to an apartment of the most regular architecture, an oblong square, with a door in perfect symmetry; and the whole executed in quite a contrary taste and manner from any of the oldest or best Gento buildings any where extant. I took particular notice of some paintings round the cornices, not for any thing curious in the design, but for the beauty and freshness of the colouring, which must have lasted some thousands of years, on supposing it, as there is all reason to suppose it, cotemporary with the building itself. The floor of the apartment is generally full of water, its pavement or ground-work not permitting it to be drawn off or to be soaked up. For it is to be observed, that even the cavern itself is not visitable after the rains until the ground of it has had time to dry into a competent hardness."

ELEPHANTIASIS, called also the *lepra of the Arabians*, in medicine, a chronic disease, one of the two species of leprosy which affects the whole body, where even the bones as well as the skin are covered with spots and tumors, which being red at last turn black. See MEDICINE-Index.

ELEPHANTINE, or ELEPHANTIS (anc. geog.), an island in the Nile to the south of Syene; with a cognominal town, where the navigation on the Nile ends, because

Elephantine.

because just below the left cataact. And here to the west of the Nile flood the last Roman garrison (Notitia Imperii).

ELEPHANTINE, in Roman antiquity, an appellation given to the books wherein were registered the transactions of the senate and magistrates of Rome, of the emperors or generals of armies, and even of the provincial magistrates; the births and classes of the people, and other things relating to the census.

They are supposed to have been so called, as being made of leaves of ivory or elephants tusks.

ELEPHANTOMACHI. See ETHIOPIA.

ELEPHANTOPUS, in botany: A genus of the polygamia segregate order, belonging to the syngnesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The calyculus is quadriflorus, with hermaphrodite florets ligulated or plane; the receptacle is naked; the pappus bristly.

ELEPHAS, the ELEPHANT, in zoology, a genus of quadrupeds belonging to the order of bruta. The characters are these: The elephant has no foreteeth in either jaw, and the dog-teeth are very long: the proboscis or trunk is long, and capable of laying hold of any thing; and the body is somewhat naked.

The elephant is the largest of all land-animals. From the front to the origin of the tail he is generally about 16 feet long, from the end of the trunk 25 feet, and about 14 feet high. The circumference of the neck is 17 feet, and the circumference of the body at the girth feet 25 feet 10 inches; the tail is about 6 feet long, and $2\frac{1}{2}$ in circumference. The circumference of the legs is about 6 feet. These are the largest dimensions. But the animal differs in size in different countries; in some not exceeding 7 feet in height. The eyes are small in proportion to the size of the animal. The muzzle is very different from that of any other quadruped; it is nothing but the origin of a long trunk which hangs between the two large tusks; the mouth appears behind the trunk, which serves in place of an upper lip, and the under lip terminates in a point. The feet are short, round, clumsy, and only distinguishable by the toes. The trunk is, properly speaking, the nose extended, and terminated by a couple of nostrils. But, besides serving as an organ of smell, the trunk performs all the functions of a strong and dexterous arm. The trunk of an elephant is about 8 feet long, $5\frac{1}{2}$ feet in circumference near the mouth, and one foot and a half near the extremity: it is a pipe of an irregular conical figure, and widened at the end: the superior side of the trunk is convex, and furrowed transversely; and the inferior side is flat, and has two longitudinal rows of small protuberances resembling the tentacula of the silk-worm and most other caterpillars. The upper part of the trunk corresponds with the extremity of the nose in other quadrupeds, and answers the same intention; the inferior part serves as an upper lip, including the nostrils at the same time. For the trunk is a continued canal, divided into two cavities by a longitudinal partition: these cavities ascend along the forepart of the upper jaw, where they make a turn inward, and descend into the palate, and then terminate in two separate orifices; they have likewise each a separate orifice at the end of the trunk. At the place where these cavities make a turn, and before they enter into the bones of the head, there is a moveable cartilaginous plate situated in such a manner

as enables the animal to shut the canal, and to prevent the water with which it occasionally fills the trunk from entering into the passage of the nose where the organs serving for the sensation of smell are placed.

The elephant can move the trunk in all directions; he can extend or shorten it at pleasure, without altering the diameters of the two canals within. By this means respiration is not interrupted, whatever be the situation of the trunk; and the water is allowed to remain till the animal chooses to throw it out by an expiration. Each canal is lined with a smooth strong membrane, and the surface of the trunk is covered with another strong membrane or skin. The substance contained between the exterior and interior membranes, is a composition of longitudinal and transverse muscles, which serve to extend and contract the length of the trunk. At the extremity of the trunk there is a concave protuberance, in the bottom of which are the two passages of the nostrils. The inferior part of the protuberance is thicker than the sides, and the superior part is stretched out like a finger about five inches long; which, together with the edges of the whole extremity of the trunk, takes on different figures according to the necessities of the animal. It is by this organ that the animal lays hold of food or other substances; which he manages with as much dexterity as a man does his hand, taking up grains of corn, or the smallest piles of grass, and conveying them to his mouth. When he drinks, he thrusts his trunk into the water, and fills it by drawing in his breath and exhaling the air: when the trunk is thus filled with water, he can either throw it out to a great distance, or drink it by putting the end of the trunk in his mouth.

The two large tusks, which some call the *horns* of the elephant, are of a yellowish colour, and extremely hard. The bony substance of which they are composed is known by the name of *IVORY*, and much used in different branches of manufacture.

The ears are very large, and resemble those of an ape. The skin of the elephant has but few hairs on it, and placed at great distances from each other. It is full of wrinkles, like those on the palm of a man's hand, besides many chapped and greasy ridges. The female has two dugs, one on each side of the breast.

M. Buffon supposed the ancients to have been "deceived, when they tell us, that the elephants copulate like other quadrupeds, the female only lowering her crupper for the more easy reception of the male." The situation of the parts seems to render this mode of junction impossible. The female elephant has not like other quadrupeds the orifice of the vagina adjacent to the anus; for it is situated nearly in the middle of the belly, about two and a half or three feet distant from the anus. On the other hand, the male organ is by no means proportioned to the magnitude of his body, nor to so long an interval, which in the situation supposed would preclude the practicability of his approach. Naturalists as well as travellers agree in affirming, that the male organ of the elephant exceeds not either in length or diameter that of a horse. It is, therefore, impossible that he should attain his end in the ordinary position of quadrupeds. The female must necessarily lie on her back. De Fynes and Tavernier positively assert, and the situation of the parts confirms their evidence, that these animals cannot intermix in

any other manner. They require, therefore, more time and convenience for this operation than other quadrupeds; and it is perhaps for this reason that they never copulate but when they enjoy full liberty, and have every necessary article at their command. The female must not only consent, but solicit the male, by a position which the never assumes unless when she thinks herself in perfect retirement." The fact, however, has been controverted by others. Dr Sparrman informs us, that in order if possible to determine the question, he let slip no opportunity of interrogating on the subject every elephant-hunter he met with at the Cape; who all agreed in replying that they were most inclined to the common opinion, if they had not been differently informed by two of their companions, Jacob Kok and Marcus Potgieter, who had actually seen elephants copulate. "I met (says our author) only with the former of these hunters, who told me he had likewise himself been of opinion that the female was obliged to lie on her back on this occasion; till at length, being out along with Potgieter hunting of elephants, he had occasion to think otherwise. On a certain spot they came to, they could reckon about eight elephants, which, on account of the small size of their tusks, they took for females, excepting two large ones; which making several circles round one of these that they took for females (the only one perhaps in rut) frequently, in all probability by way of caressing her, struck her with their trunks, till at length she threw herself down upon her knees, and keeping the spine of her back in a stiff and extended position, brought her hind feet quite close to her fore-feet, or somewhat beyond them; so that she almost as it were stood upon her head. In this forced posture they saw her wait a long while together for the carresses of the males, who, in fact, likewise endeavoured to perform the matrimonial rites, but from jealousy hindered each other whenever either of them began to mount. After two hours had thus elapsed, the patience of our hunters began to tire; and the rather, because on account of the uneven and stoney nature of the ground, which, however, had no wood upon it, and of a river being between them, they could not dare to advance and fire at these animals. I will not dissemble, that though I have not the least occasion to doubt the veracity of my informer, and though what he told me is by no means impossible, I yet find great difficulty in this matter. But on the other hand, the same may be said of M. Buffon's or the common opinion; first, as they have not been able to confirm it by the testimony of any eye-witness, nor even by any instance of this kind in other quadrupeds properly so called; that is, in such animals as have some degree of affinity with elephants; secondly, as the female's lying on her back can hardly be more convenient for the male, especially as the vagina, according to what I am told, goes from the fore-part backwards; thirdly, it is besides well known, that the older elephants, on account of the unyieldingness of their bodies, chiefly stand when they sleep, in order to avoid the trouble and difficulty of lying down and getting up again. Tavernier, indeed, in his third volume, informs us, that the tame females when in rut make themselves a kind of bed, and lay themselves in it on their backs, at the same time inviting the male elephant by a peculiar cry, &c. but as the author did not see this himself, and that besides it

is entirely contrary to the modesty and dislike to copulation for which the female elephants have always been remarked, I cannot do otherwise than leave M. Tavernier's relation and different opinions touching the subject to the test of future experience."

Mr J. C. Wolf, however, in his *Voyage to Ceylon* lately published, confirms the common opinion, and gives an account of the operation in question as if he had more than once seen it performed. "The male (he informs us) makes a pit or hollow in the ground, and assists his consort to lay herself on her back; and in case he finds her perfectly compliant and agreeable, very complaisantly helps her up again after the business is finished (for she cannot possibly rise of herself), by throwing his trunk round her neck; but if she at first stood shilly-shally, and gave herself prodigious airs, he then even lets her lie, and goes about his business." But concerning the credit due to this author, the public seem not to be agreed. On the other hand, M. Buffon, in his Supplement, has retracted his former opinion, upon the authority of M. Bles (secretary during 12 years to the Dutch government in Ceylon); who describes the copulation of these animals in the same manner as Farmer Kok does in the extract above given from Dr Sparrman. "Having perceived (says M. Bles) that the Count de Buffon, in his excellent work, is deceived with regard to the copulation of the elephants, I know, that in several parts of Asia and Africa these animals, especially during the season of love, remain almost in the most inaccessible places of the forests; but in the island of Ceylon, where I lived 12 years, the land being every where inhabited, they cannot so easily conceal themselves; and having often examined them, I perceived that the female organ is situated nearly under the middle of the belly, which would lead us to think, with M. Buffon, that the males cannot cover the females in the manner of other quadrupeds. However, there is only a slight difference of situation. When they inclined to copulate, I perceived that the female bowed down her head and neck, and leaned her two fore-legs, which were also bended, upon the root of a tree, as if she meant to prostrate herself on the ground; and the two hind-legs remained erect, which gave the male an opportunity of embracing her as other quadrupeds do. I can likewise affirm, that the females go with young about nine months. Moreover, the elephants never copulate unless when in a state of freedom. In the season of love, the males are strongly chained for four or five weeks, during which time they discharge vast quantities of semen, and are so furious, that their cornacks or governors cannot come near them without danger. The approach of the rutting season is easily known; for some days before it happens, an oily liquor flows from a small hole on each side of the head. The domestic female on these occasions sometimes makes her escape, and joins the wild males in the woods. Some days afterward, her cornack goes in quest of her, and calls her by her name till she comes. She submits to him with complacency, and allows herself to be conducted home, and shut up in the stable. It was from cases of this kind that it was discovered that the females bring forth about the end of nine months." The first remark, with regard to the mode of copulating, M. Buffon thinks unquestionable, since M. Marcel Bles assures us that he has seen the elephants perform the operation. But as to the time

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time of gestation, which he limits to nine months, we ought to suspend our judgment, because all travellers affirm that the female elephant is believed to go with young no less than two years.

Elephants, even in a savage state, are peaceable and gentle creatures. They never use their weapons but in defence of themselves or companions. Their social dispositions are so strong, that they are seldom found alone, but march always in large troops: the oldest and most-experienced lead the van; the younger, or lame ones, keep in the middle; and those of a second rate, as to age, walk in the rear. The females carry their young on their tusks, embracing them at the same time with their trunk. They seldom march in this regular order but when they reckon the journey dangerous, such as an expedition to cultivated lands, where they expect to meet with resistance. On other occasions they are less cautious; some of them falling behind or separating from the rest, but seldom so far as to be without the reach of assistance by alarming and assembling their companions. It is dangerous to offer them the least injury; for they run straight upon the offender; and although the weight of their body be great, their steps are so large, that they easily outrun the swiftest man, whom they either pierce with their tusks, or seize with their trunk, dart him in the air like a stone, and then trample him under their feet. But they never attack any person unless when provoked. However, as they are extremely sensible and delicate with regard to injuries, it is always prudent to keep out of their way. Travellers who frequent these countries kindle large fires, and beat drums during the night, in order to prevent their approach. After being once attacked by men, or falling into any ambush, they are said never to forget the injury, but search for every opportunity of getting revenge. As they are endowed perhaps with a more exquisite sensation of smell than any other animal, owing to the great extent of their nose, they can scent a man at a very great distance, and trace him by his footsteps.

Elephants are peculiarly fond of the banks of rivers, deep valleys, and marshy grounds, especially when well shaded with trees. They delight in drawing up water into their trunks, even when they do not drink it, and amuse themselves in dashing the water around. They cannot endure cold, and are equally averse to an excess of heat: in order to avoid the scorching heat of the sun, they retire to the thickest and most shady parts of the forest. The bulk of their bodies is so enormous, that they do not choose to go into deep waters so frequently as some other quadrupeds; although the length of their trunk, which they raise straight up, and by which they respire, is a great advantage in swimming.

The ordinary food of elephants is roots, herbs, leaves, the tender branches of trees, fruits, and grains; but they abhor flesh or fish. When any of them discovers a fine pasture, he immediately calls and invites his companions to come and eat with him. As they devour a large quantity of food in a short time, they

are always shifting their pasture; when they meet with cultivated grounds, they make a prodigious desolation, and destroy more plants by their feet than they use for nourishment: which last is very considerable, amounting to 150 pounds of herbage every day: by this means, as they constantly graze in large troops, they lay waste whole fields in an hour. The Indians and negroes employ every art to prevent them from visiting their cultivated lands, making great noises, and burning large fires round their fields. However, these precautions are not always sufficient to prevent the elephants from visiting them. They chase away the domestic animals, put the men to flight, and sometimes even throw down their timber huts. Elephants are hardly susceptible of fear: the only things which can surprise them or stop their course are artificial fires, such as squibs, crackers, &c. the effects of which are so sudden and so quickly repeated, that the elephants frequently turn back; and when one runs, all the rest instantly follow his example.

Although the social disposition in the elephant be exceeding strong; yet whenever the females come in season, it immediately gives place to the stronger and more interesting passion of love. They observe the greatest delicacy in their amours, abhorring nothing so much as to be seen by their companions. The troop divide themselves into couples, steal off into the most secret places of the forest, and then give way to all the impulses of nature, which are lively and lasting in proportion to the long period of abstinence; for, according to all accounts, except that of M. Bles already noticed (A), the female goes with young two years, and it is only once in three years that the season of love returns. They bring forth but one at a time; which, as soon as it comes into the world, is as large as a wild boar, and is furnished with teeth: however, the large tusks do not make their appearance till some time after, and at the age of six months they are several inches long. Elephants of this age are as large as an ox when in a natural state.

The manner of taking and taming elephants, therefore, merits our attention. In forests and such places as are frequented by elephants, the Indians choose a spot and inclose it with strong palisades; they use the largest trees as the principal stakes, to which are fixed smaller ones in a transverse direction. These cross trees are fixed so as to allow a man to pass easily through. There is likewise a large port left for the elephant, over which is suspended a strong barrier, which is let down as soon as he enters. In order to decoy him into the inclosure, the hunters take along with them a tame female in season, and travel about till they come so near as that the cry of the female can reach a male, whom they previously observe in the forest; then the guide of the female makes her give the cry peculiar to the season of love: the male instantly replies, and sets out in quest of her. The guide then makes the female proceed towards the artificial inclosure, repeating her cries from time to time as she goes along. She enters into

(A) Mr Bles's information is adopted by Mr Pennant: That they go only nine months with young, he says, is guessed by the casual escape of the tame females, when in rut, into the woods; where they couple with the wild; are soon discovered and brought back, and observed to bring forth in about nine months from the time.

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into the inclosure, the male follows her, and the Indians immediately shut the port behind him. He no sooner discovers the hunters, and that he is inclosed, than his passion for the sex is converted into rage and fury. The hunters entangle him with strong ropes; they fetter his legs and trunk; they bring two or three tame elephants in order to pacify and reconcile him to his condition. In a word, they reduce him to obedience in a few days, by a proper application of torture and caresses. There are many other methods of catching elephants. Instead of making large inclosures with palisades, like the kings of Siam, and other monarchs, the poor Indians content themselves with a very simple apparatus: they dig deep pits in the roads frequented by elephants, covering them over with branches of trees, turf, &c. When an elephant falls into one of these pits, he is unable to get out again.

The elephant, when tamed, is the most friendly and obedient of all animals: he is entirely attached to the person who feeds and takes care of him. In a short time he understands signs, and the sound of his master's voice. He distinguishes the language of passion, of command, of satisfaction; and acts accordingly. He receives his orders with attention, and executes them with prudence and alacrity, but without precipitation. He easily learns to bow his knees and lower his body, for the convenience of those who mount him. He caresses his friends with his trunk. He lifts burdens with his trunk, and assists those who are loading him in laying them on his back. He delights in shining harness and trappings. When yoked in a cart or wagon, he pulls equally and cheerfully, unless he be abused by injudicious chastisements. His guide is generally mounted on his neck, with a small rod of iron sharp at the point in his hand; he directs his motion by pricking him on the ears and head; but, for the most part, a word is sufficient.

A tame elephant will do more labour than six horses; but then he requires a proportional quantity of food. They are the principal beasts of burden in many parts of Africa and the East Indies. They carry sacks and bundles of all kinds on their neck, back, and tusks. They never lose or damage any thing committed to their care: they will stand on the edge of a river, take bundles off their necks and tusks, lay them carefully in a boat wherever they are desired, and try with their trunk whether they are properly situated; if they be loaded with casks, they go in quest of stones to prop them and prevent them from rolling.

The elephant is not only the most tractable, but the most intelligent, of animals; sensible of benefits, resentful of injuries, and endowed even with a sense of glory.—In India, they were once employed in the launching of ships: one was directed to force a very large vessel into the water; the work proved superior to his strength: his master, with a sarcastic tone, bid the keeper take away this lazy beast and bring another: the poor animal instantly repeated his efforts, fractured his skull, and died on the spot. In Delli, an elephant passing along the streets, put his trunk into a taylor's shop, where several people were at work: one of them pricked the end with his needle: the beast passed on; but in the next dirty puddle filled his trunk with water, returned to the shop, and spurring every

drop among the people who had offended him, spoiled their work.

An elephant in Admeeer, which often passed the bazar or market, as he went by a certain herewoman, always received from her a mouthful of greens: at length he was seized with one of his periodical fits of rage, broke his fetters, and, running through the market, put the crowd to flight; among others, this woman, who in haste forgot a little child she had brought with her. The animal recollecting the spot where his benefactress was wont to sit, took up the infant gently in his trunk, and placed it in safety on a stall before a neighbouring house. Another, in his madness, killed his *cornac* or governor: the wife seeing the misfortune, took her two children and flung them before the elephant, saying, "Now you have destroyed their father, you may as well put an end to their lives and mine." It instantly stopped, relented, took the greatest of the children, placed him on its neck, adopted him for his *cornac*, and never afterwards would permit any body else to mount it.

A soldier at Pondicherry, who was accustomed, whenever he received the portion that came to his share, to carry a certain quantity of it to one of these animals, having one day drank rather too freely, and finding himself pursued by the guards, who were going to take him to prison, took refuge under the elephant's body and fell asleep. In vain did the guard try to force him from this asylum, as the elephant protected him with his trunk. The next morning the soldier, recovering from his drunken fit, shuddered with horror to find himself stretched under the belly of this huge animal. The elephant, which without doubt perceived the man's embarrassment, caressed him with his trunk, in order to inspire him with courage and make him understand that he might now depart in safety.

A painter was desirous of drawing the elephant which was kept in the menagerie at Versailles in an uncommon attitude, which was that of holding his trunk raised up in the air with his mouth open. The painter's boy, in order to keep the animal in this posture, threw fruit into his mouth; but as the lad frequently deceived him, and made an offer only of throwing him the fruit, he grew angry; and, as if he had known that the painter's intention of drawing him was the cause of the affront that was offered him, instead of revenging himself on the lad, he turned his resentment on the master, and taking up a quantity of water in his trunk, threw it on the paper on which the painter was drawing, and spoiled it.

At the Cape of Good Hope, it is customary to kill those animals, for the sake of their teeth, by the chase. Three horsemen, well mounted and armed with lances, attack the elephant alternately, each relieving the other as they see their companion pressed, till the beast is subdued. Three Dutchmen (brothers), who had made large fortunes by this business, determined to retire to Europe, and enjoy the fruits of their labours; but resolved, before they went, to have a last chase by way of amusement: they met with their game, and began the attack in the usual manner; but unfortunately one of their horses fell down and flung its rider: the enraged animal instantly seized the unhappy man with its trunk, flung him up to a vast height in the air, and received

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Ibid.

Buffon, p. 78.

Mém. pour servir à l'Hist. des animaux, par M. de l'Acad. des Sciences, Part III.

Voyage de la Gaillie, p. 160.

Indelph. com. in hist. Ethiop. p. 147.

ceived him on one of its tusks; then turning towards the two other brethren, as if it were with an aspect of revenge and insult, held out to them the impaled wreath writhing on the bloody tooth.

From the earliest accounts in history, the eastern nations have employed elephants in war; Alexander the Great was the first European who ever mounted an elephant. He carried a number of them into Greece, which Pyrrhus employed some years after against the Romans at the battle of Tarentum. Both the Greeks and Romans soon learnt to get the better of those monstrous animals: they opened their ranks and allowed them to pass through; neither did they attempt to hurt them, but threw darts, &c. at their guides. Now that fire-arms are the principal instruments of war, elephants, who are terrified at the noise and flame, instead of being useful, would only tend to embarrass and confuse an army. However, in Cochín and other parts of Malabar, as also in Tonquin, Siam, and Pegu, where fire-arms are little understood, they are still used in battle. The guide fits altride upon the neck, and the combatants sit or stand upon the other parts of the body. They are also extremely serviceable in fording of rivers, and carrying over the baggage on their backs. After the keepers have loaded them with several hundred weight, they fasten ropes to them; of which the soldiers taking hold, either swim or are drawn across the river. In time of action, they now and then fix an heavy iron chain to the end of their trunks, which they whirl round with such agility, as to make it impossible for an enemy to approach them at that time. Another use they still have for this creature in war, is to force open the gates of a city or garrison which is closely besieged. This he does by setting his backside against them, rigging backwards and forwards with his whole weight, till he has burst the bars, and forced an entrance: to prevent which, most of the garrisons in this country have large spikes stuck in their gates, that project to a considerable distance. However, after all, those prodigious animals are kept more for show and grandeur than for use, and their keeping is attended with a very great expence, for they devour vast quantities of provision; and you must sometimes regale them with a plentiful repast of cinnamon, of which they are excessively fond. It is said to be no uncommon thing with a Nabob, if he has a mind to ruin a private gentleman, to make him a present of an elephant, which he is ever afterwards obliged to maintain at a greater expence than he can afford: by parting with it, he would certainly fall under the displeasure of the grandee, besides forfeiting all the honour which his countrymen think is conferred upon him by so respectable a present.

When the elephant is properly managed, he lives very long even in a state of slavery and labour. That some have lived in this state 120 years, is pretty well authenticated. In a natural state, they often exceed 200 years, and propagate their species till they are 120: It is 30 years before they come to their full growth.

The elephant inhabits India, and some of its greater islands, Cochín China, and some of the provinces of China. It abounds in the southern parts of Africa, from the river Senegal to the Cape; and from thence as high as Ethiopia on the other side. They are found in the greatest numbers in the interior parts, where

there are vast forests, near the sides of rivers. The wild elephants of Ceylon live in troops or families distinct and separate from all others, and seem to avoid the strange herds with particular care. When a family removes from place to place, the largest-tusked males put themselves at the head; and if they meet with a large river, are the first to pass it. On arriving on the opposite bank, they try whether the landing-place is safe: in case it is, they give a signal of a note from the trunk, as if it were the sound of a trumpet, on which the remaining part of the old elephants swim over; the little elephants follow, holding one another by locking their trunks together; and the rest of the old ones bring up the rear. In the woods are often seen a solitary male elephant, wandering like an outlaw banished from the herd and all the race. These are as if in a state of deperation, and very dangerous. A single man will put to flight whole herds of social elephants: this alone fears not his presence, but will stand firm, putting his power to defiance. Elephants are not at present domesticated in Africa, but only in the more civilized parts of Asia. They are much more numerous in Africa. In some parts they swarm so, that the negroes are obliged to make their habitations under ground for fear of them. They are killed and eaten by the natives, and the trunk is said to be a delicious morsel. All the teeth are brought from Africa: they are frequently picked up in the woods; so that it is uncertain whether they are shed teeth, or those of dead animals. The African teeth which come from Mosambique are ten feet long; those of Malabar only three or four; the largest in Asia are those of Cochín China, which even exceed the size of the elephants of Mosambique. The skin is thick, and, when dressed, proof against a musket ball. The flesh, the gall, the skin, and the bones, are said to be used medicinally by the Chinese. See Plate CLXXX.

ELEVATION, the same with ALTITUDE or height.

ELEVATION of the Host, in the church of Rome, that part of the mass where the priest raises the host above his head for the people to adore.

ELEVATOR, in anatomy, the name of several muscles, so called from their serving to raise the parts of the body to which they belong.

ELEVATORY, in surgery, an instrument for raising depressed or fractured parts of the skull, to be applied after the integuments and periosteum are removed. See SURGERY.

ELEVE, a term purely French, though of late used also in our language. Literally it signifies a disciple or scholar bred up under any one, being formed from the Italian *allievo*, an "apprentice" or "novice."

It was first used by the French writers in speaking of painters; such a painter was an *eleve* of Da Vinci, of Raphael, &c. From painting it came to be applied to such as studied or learned any other art under a master. In the Royal Academy of Sciences, there were 20 *eleves*: and in that of inscriptions, 10 *eleves*. The *eleves* are to act in concert with the pensionaries. See ACADEMY.

The denomination *eleve*, however, has been since suppressed, and that of *adjoint* substituted in its room; because every body did not know the sense affixed to it by the academy: and now the pensionary academicians have not, as formerly, each of them an *eleve*; but the

cleaves are become adjoints, or associates of the academy.

ELEVENTH, or chord of the eleventh. See INTERVAL.

ELEUSINIA, in Grecian antiquity, a festival kept in honour of Ceres, every fourth year by some states, but by others every fifth. The Athenians celebrated it at Eleusis, a town of Attica; whence the name.

Ceres, says an Athenian orator (Isocrates), wandering in quest of her daughter Proserpine, came into Attica, where some good offices were done her, which it is unlawful for those who are not initiated to hear. In return she conferred two unparalleled benefits; to wit, the knowledge of agriculture, by which the human race is raised above the brute creation; and the mysteries, from which the partakers derive sweeter hopes than other men enjoy, both as to the present life and to eternity. It was the popular opinion, that the Eleusinian goddesses suggested prudent counsel to their votaries, and influenced their conduct; that these were respected in the infernal regions, and had precedence in the assemblies of the blessed; while the unhallowed were in utter darkness, wallowing in mire, or labouring to fill a leaky vessel. The Athenians were solicitous to secure these advantages to their children, by having them initiated as soon as was allowed.

Ceres was supposed to be particularly partial to Eleusis and its vicinity. There were the memorials of her presence and of her bounty; the well-named *Callichorus*, by which she had rested, in the reign of Erechtheus; the stone on which the fat, named the *farrow-sul*; the Rharian plain, where barley was first sown; and the threshing-floor and altar of Triptolemus, a herdman whom she instructed in the culture of that grain, the use of which succeeded to acorns. Her mysteries continued to possess a pre-eminence in holiness, and to be accounted as much superior to all other religious festivals as the gods were to the heroes. Even the garments worn at the solemnity were supposed to partake of their efficacy, and to be endued with signal virtues. It was usual to retain them until they were perishing; and then to dedicate them in the temple, or to reserve them for the purpose of enveloping new-born children.

The mystic temple, as it was called, provided by Pericles for the solemnity, created such awe by its sanctity as could be equalled only by the effect of its beauty and magnitude, which excited astonishment in every beholder. The profane or uninitiated were forbidden to enter it on any pretence. Two young Arcadianians happened inadvertently to mix with the crowd at the season of the mysteries, and to go in; but the question suggested by their ignorance presently betrayed them, and their intrusion was punished with death. The chief priest, hierophant, or mystagogue, was taken from the Eumolpidae, a holy family flourishing at Athens, and descended from Eumolpus, a shepherd and favourite of Ceres. He was enjoined celibacy, and wore a stole or long garment, his hair, and a wreath of myrtle. The grand requisites in his character were strength and melody of voice, solemnity of deportment, magnificence, and great decorum. Under him, besides many of inferior station, was the caduchus or torch-bearer, who had likewise his hair,

with a fillet; the priest, who officiated at the altar; and the hiero-ceryx or sacred herald; all very important personages. The latter was of a family which claimed the god Mercury and Aglauros the daughter of Cereops for its ancestors.

The secrecy in which the mysteries were enveloped, served to enhance the idea of their consequence, and to increase the desire of participation. It was so particular, that no person was allowed even to name the hierophant by whom he had been initiated. Public abhorrence and detestation awaited the babblers, and the law directed he should die.

The Athenians suffered none to be initiated into these mysteries but such as were members of their city. This regulation, which compelled Hercules, Castor, and Pollux, to become citizens of Athens, was strictly observed in the first ages of the institution, but afterwards all persons, barbarians excepted, were freely initiated.

The festivals were divided into great and less mysteries. The less were instituted from the following circumstance. Hercules passed near Eleusis while the Athenians were celebrating the mysteries, and desired to be initiated. As this could not be done, because he was a stranger, and as Eumolpus was unwilling to displease him on account of his great power, and the services which he had done to the Athenians, another festival was instituted without violating the laws. It was called *μυσται*, and Hercules was solemnly admitted to the celebration and initiated. These less mysteries were observed at Agræ near the Ilissus. The greater were celebrated at Eleusis, from which place Ceres has been called *Eleusinia*. In later times the smaller festivals were preparatory to the greater, and no person could be initiated at Eleusis without a previous purification at Agræ. This purification they performed by keeping themselves pure, chaste, and unpolluted, during nine days; after which they came and offered sacrifices and prayers, wearing garlands of flowers, called *στέμματα* or *στεφάνια*, and having under their feet *Διὸς καύσιον*, *Jupiter's skin*, which was the skin of a victim offered to that god. The person who assisted was called *ὕδαρος* from *ὕδαρ* water, which was used at the purification, and they themselves were called *μυσταί*, the initiated.

A year after the initiation at the less mysteries they sacrificed a fow to Ceres, and were admitted in the greater, and the secrets of the festivals were solemnly revealed to them, from which they were called *ἐποροι* and *ἐκπορταί*, *inspectors*.

This festival was observed in the month Boedromion or September, and continued nine days from the 15th till the 23d. During that time it was unlawful to arrest any man or present any petition, on pain of forfeiting a thousand drachmas, or according to others on pain of death. It was also unlawful for those who were initiated to sit upon the cover of a well, to eat beans, mullets, or weazels. If any woman rode to Eleusis in a chariot, she was obliged by an edict of Lycurgus to pay 6,000 drachmas. The design of this law was to destroy all distinction between the richer and poorer sort of citizens. When the season approached, the mystæ or persons who had been initiated only in the lesser mysteries, repaired to Eleusis to be instructed in the ceremonial. The service for the opening of the temple, with morning sacrifice, was performed.

Eleusinia. formed. The ritual was then produced from the fancu-
 tuary. It was enveloped in fymbolical figures of animals,
 which fuggelted words compendionly, in letters
 with ligatures, implicated, the tops huddled together,
 or difpofed circularly like a wheel; the whole utterly
 inexplicable to the profane. The cafe, which was
 called *Petroma*, confifted of two ftones exactly fitted.
 The myfterious record was replaced after the reading,
 and clofed up until a future feftival. The principal
 rite was nocturnal, and confined to the temple and its
 environs. The myfte waited without, with impatience
 and apprehenfion. Lamentations and ftrange
 noifes were heard. It thundered. Flafhes of light
 and of fire rendered the deep fucceeding darknefs more
 terrible. They were beaten, and perceived not the
 hand. They beheld frightful apparitions, monfters,
 and phantoms of a canine form. They were filled
 with terror, became perplexed and unable to ftir.
 The fcene then fuddenly changed to brilliant and
 agreeable. The propylæa or vestibules of the temple
 were opened, the curtains withdrawn, the hidden
 things difplayed. They were introduced by the hiero-
 phant and daduchus, and the former fhewed them the
 myfteries. The fplendor of illumination, the glory
 of the temple and of the images, the finging and dancing
 which accompanied the exhibition, all contributed
 to foother the mind after its late agitation, and to render
 the wondering devotee tranquil and felf-fatisfied. After
 this infpection, or, as it was called, the *autopfia*,
 they retired, and others advanced. The fucceeding
 days were employed in purification, in facifice, in
 pompous proceffions, and fpectacles, at which they
 affifted, wearing myrtle-crowns. The fecond day was
 called *πρωτη μυστα*, *to the fea, you that are initiated*; becaufe
 they were commanded to purify themfelves by bathing
 in the fea. On the third day facrifices, and chiefly a
 mullet, were offered; as alfo barley from a field of
 Eleufis. Thefe oblations were called *Θυια*, and held fo
 facred that the priefts themfelves were not, as in other
 facrifices, permitted to partake of them. On the
 fourth day they made a folemn proceffion, in which
 the *καλαθιον*, *holy bafket of Ceres* was carried about in a
 confecrated cart, while on every fide the people flouted
χαρις δακρυρις, *Hail, Ceres!* After thefe followed women,
 called *κινοφοροι*, who *carried bafkets*, in which was fea-
 min, carded wool, grains of falt, a ferpent, pomegrana-
 tes, reeds, ivy boughs, certain cakes, &c. The fifth
 was called *ἡ τῶν λαμπάδων ἡμέρα*, *the torch day*; becaufe
 on the following night the people ran about with
 torches in their hands. It was ufual to dedicate
 torches to Ceres, and contend which fhould offer the
 biggeft, in commemoration of the travels of the god-
 defs, and of her lighting a torch in the flames of mount
Ætna. The fixth day was called *Ιαχχορις*, from *Iacchus*,
 the fon of Jupiter and Ceres, who accompanied his
 mother in her fearch after Proferpine with a torch in
 his hand. From that circumftance his ftatue had a
 torch in his hand, and was carried in folemn proceffion
 from the *Geramicus* to Eleufis. The ftatue with
 thofe that accompanied it, called *Ιαχχουχοι*, was
 crowned with myrtle. In the way nothing was heard
 but finging and the noife of brazen kettles as the vo-
 taries danced along. The way through which they
 iffued from the city was called *ἱερα ὁδος*, *the fared way*,
 the reffing place *ἱερα ἄνκω*, from a *fig-tree* which grew in

the neighbourhood. They alfo ftopped on a bridge
 over the *Cephifus*, where they derided thofe that paffed
 by. After they had paffed this bridge, they entered
 Eleufis by a place called *αὐτὴν ἡ μυστικὴν εἰσόδον*, *the myftical entrance*.
 On the feventh day were fports, in which the victors
 were rewarded with a meafure of barley, as that grain
 had been firft fown in Eleufis. The eighth day was
 called *Ἐπιδαυριανὴ νύκτα*, becaufe once *Æſculapius* at his
 return from *Epidaurus* to Athens was initiated by the
 repetition of the lefs myfteries. It became cuftomary,
 therefore, to celebrate them a fecond time upon this,
 that fuch as had not hitherto been initiated might be
 lawfully admitted. The ninth and laft day of the
 feftival was called *ἱερὰς ὑγῆας*, *earthen veffels*, becaufe it
 was ufual to fill two fuch veffels with wine; one of
 which being placed towards the eaft, and the other to-
 wards the weft; which, after the repetition of fome
 myftical words, were both thrown down, and the
 wine being fpilt on the ground was offered as a li-
 bation.

The ftory of Ceres and Proferpine, the foundation of
 the Eleufinian myfteries, was partly local. It was both
 verbally delivered, and reprefented in allegorical fhew.
 Proferpine was gathering flowers when fhe was ftolen by
 Pluto. Hence the proceffion of the holy bafket, which
 was placed on a car dragged along by oxen, and followed
 by a train of females, fome carrying the myftic chefts,
 fhouting, *Hail, Ceres!* At night a proceffion was made
 with lighted torches, to commemorate the goddefs
 fearching for her daughter. A meafure of barley, the
 grain which, it was believed, the had given, was the re-
 ward of the victors in the gymnic exercifes; and the
 tranſaction at the temple had a reference to the le-
 gend. A knowledge of thefe things and places, from
 which the profane were excluded, was the amount of
 initiation; and the mode of it, which had been devifed
 by craft, was fkillfully adapted to the reigning fuper-
 ftitions. The operation was forcible, and the effect
 in proportion. The priefthood flourifhed as piety in-
 creafed. The difpenfation was corrupt, but its ten-
 dency not malignant. It produced fancify of man-
 ners and an attention to the focial duties; defire to
 be as diftinguifhed by what was deemed virtue as by
 fentence.

Some have fuppofed the principal rites at this fefti-
 val to have been obfcene and abominable, and that
 from thence proceeded all the myfterious fecrecy. They
 were carried from Eleufis to Rome in the reign of
 Adrian, where they were obferved with the fame ce-
 remonies as before, though perhaps with more free-
 dom and licentiousnefs. They lafted about 1800
 years, and were at laft abolifhed by Theodofius the
 Great.

ELEUSIS, (anc. geog.) a town in Attica between
 Megara and the Piræus, celebrated for the feftivals of
 Ceres. See the preceding article.—Thofe rites were fi-
 nally extinguifhed in Greece upon the invafion of Alaric
 the Goth. Eleufis, on the overthrow of its goddefs
 and the ceffation of its gainful traffic, probably became
 foon an obfcure place, without character or riches.
 For fome ages, however, it was not entirely forfaken,
 as is evident from the vaft confumption of the ancient
 materials, and from the prefent remains, of which
 the following account is given by Dr Chandler. *Travels in*
 “ The port was fmall and of a circular form. The *Greece,*
 ftones *p. 189.*

Eleusinia.

stones of one pier are seen above water, and the corresponding side may be traced. About half a mile from the shore is a long hill, which divides the plain. In the side next the sea are traces of a theatre, and on the top are cisterns cut in the rock. In the way to it, some masses of wall and rubbish, partly ancient, are standing; with ruined churches; and beyond, a long broken aqueduct crosses to the mountains. The Christian pirates had infested the place so much, that in 1676 it was abandoned. It is now a small village at the eastern extremity of the rocky brow, on which was once a castle; and is inhabited by a few Albanian families, employed in the culture of the plain, and superintended by a Turk, who resides in an old square tower. The proprietor was Achmet Aga, the prime or principal person of Athens.

"The mystic temple at Eleusis was planned by Ictinus, the architect of the Parthenon. Pericles was overseer of the building. It was of the Doric order; the cell so large as to admit the company of a theatre. The columns on the pavement within, and their capitals, were raised by Corebus. Metagenes of Xypete added the architraves and the pillars above them, which sustained the roof. Another completed the edifice. This was a temple in *antis*, or without exterior columns, which would have occupied the room required for the victims. The aspect was changed to *Protylos* under Demetrius the Phalerean; Philo a famous architect erecting a portico, which gave dignity to the fabric, and rendered the entrance more commodious. The site was beneath the brow, at the east end, and encompassed by the fortrefs. Some marbles, which are uncommonly massive, and some pieces of the columns, remain on the spot. The breadth of the cell is about 150 feet; the length, including the pronaos and portico, is 216 feet; the diameter of the columns, which are fluted 6 inches from the bottom of the shafts, is 6 feet and more than 6 inches. The temple was a decastyle or had 10 columns in the front, which was to the east. The peribolus or inclosure, which surrounded it on the north-east and on the south side, measures 387 feet in length from north to south, and 328 feet in breadth from east to west. On the west side it joined the angles of the west end of the temple in a straight line. Between the west wall of the inclosure and temple and the wall of the citadel was a passage of 42 feet 6 inches wide, which led to the summit of a high rock at the north-west angle of the inclosure, on which are visible the traces of a temple in *antis*, in length 74 feet 6 inches from north to south, and in breadth from the east to the wall of the citadel, to which it joined on the west, 54 feet. It was perhaps that sacred to Triptolemus. This spot commands a very extensive view of the plain and bay. About three-fourths of the cottages are within the precincts of the mystic temple, and the square tower stands on the ruined wall of the inclosure.

"At a small distance from the north end of the inclosure is a heap of marble, consisting of fragments of the Doric and Ionic orders; remains, it is likely, of the temples of Diana Propylea and of Neptune, and of the Propyleum or gateway. Wheler saw some large stones carved with wheat-ears and bundles of poppy. Near it is the built of a colossal statue of excellent workmanship, maimed, and the face disfigured; the

breadth at the shoulders, as measured by Pococke, 5 feet and an half; and the basket on the head above 2 feet deep. It probably represented Proserpine. In the heap are two or three inscribed pedestals; and on one are a couple of torches, crossed. We saw another fixed in the stone stairs, which lead up the square tower on the outside. It belonged to the statue of a lady, who was hierophant or priestess of Proserpine, and had covered the altar of the goddess with silver. A well in the village was perhaps that called Callichorus, where the women of Eleusis were accustomed to dance in honour of Ceres. A tradition prevails, that if the broken statue be removed, the fertility of the land will cease. Achmet Aga was fully possessed with this superstition, and declined permitting us to dig or measure there, until I had overcome his scruples by a present of a handsome snuff box containing several zechins or pieces of gold."

ELEUTHERIA, a festival celebrated at Platea in honour of Jupiter *Eleutherius*, or "the affessor of liberty," by delegates from almost all the cities of Greece. Its institution originated in this: After the victory obtained by the Grecians under Pausanias over Mardonius the Persian general in the country of Platea, an altar and statue were erected to Jupiter Eleutherius, who had freed the Greeks from the tyranny of the barbarians. It was further agreed upon in a general assembly, by the advice of Aristides the Athenian, that deputies should be sent every fifth year, from the different cities of Greece, to celebrate Eleutheria, festivals of liberty. The Plateans celebrated also an anniversary festival in memory of those who had lost their lives in that famous battle. The celebration was thus: At break of day a procession was made with a trumpeter at the head, sounding a signal for battle. After him followed chariots loaded with myrrh, garlands, and a black bull, and certain free young men, as no signs of servility were to appear during the solemnity, because they in whose honour the festival was instituted had died in the defence of their country. They carried libations of wine and milk in large-eared vessels, with jars of oil, and precious ointments. Last of all appeared the chief magistrate, who, though not permitted at other times to touch iron, or wear garments of any colour but white, yet appeared clad in purple, and taking a water-pot out of the city chamber, proceeded through the middle of the town, with a sword in his hand, towards the sepulchres. There he drew water from a neighbouring spring, and washed and anointed the monuments, after which he sacrificed a bull upon a pile of wood, invoking Jupiter and infernal Mercury, and inviting to the entertainment the souls of those happy heroes who had perished in the defence of their country. After this he filled a bowl with wine, saying, I drink to those who lost their lives in the defence of the liberties of Greece. There was also a festival of the same name observed by the Samians in honour of the god of love. Slaves also, when they obtained their liberty, kept a holiday, which they called *Eleutheria*.

ELF, a term now almost obsolete, formerly used to denote a fairy or hobgoblin; an imaginary being, the creature of ignorance, superstition, and craft. See FAIRY.

Elf-Arrows, in natural history, a name given to the flints.

Eleutheria, ELF.

Elgin flints anciently fashioned into arrow-heads, and still found fusile in Scotland, America, and several other parts of the world: they are believed by the vulgar to be shot by faeries, and that cattle are sometimes killed by them.

ELGIN, the capital of the county of Moray in Scotland, and formerly a bishop's see, is situated on the river Lofey about six miles north from the Spey, in W. Long. 2. 25. N. Lat. 57. 40. Mr Pennant says, it is a good town, and has many of the houses built over piazzas; but, excepting its great cattle-fairs, has little trade. It is principally remarkable for its ecclesiastical antiquities. The cathedral, now in ruins, has been formerly a very magnificent pile. The west door is very elegant and richly ornamented. The choir is very beautiful, and has a fine and light gallery running round it; and at the east end are two rows of narrow windows in an excellent Gothic taste. The chapter-house is an octagon; the roof supported by a fine single column with neat carvings of coats of arms round the capital. There is still a great tower on each side of this cathedral; but that in the centre, with the spire and whole roof, are fallen in; and form most awful fragments, mixed with the battered monuments of knights and prelates. Boethius says, that Duncan, who was killed by Macbeth at Inverness, lies buried here. The place is also crowded with a number of modern tomb-stones.—The cathedral was founded by Andrew de Moray, in 1224, on a piece of land granted by Alexander II.; and his remains were deposited in the choir, under a tomb of blue marble, in 1244. The great tower was built principally by John Innes bishop of this see, as appears by the inscription cut on one of the great pillars: “Hic Jacet in Xto, pater et dominus, Dominus Johannes de Innes hujus ecclesie Episcopus;—qui hoc notabile opus incepit et per septennium ædificavit.” Elgin is a royal borough; and gives title of earl to the family of Bruce.

ELIAS, the prophet, memorable for having escaped the common catastrophe of mankind; being taken up alive into heaven, in a fiery chariot, about 895 B. C. See the Bible.

ELICHMAN (John), a native of Silesia in the 17th century, who practised physic at Leyden, and was remarkable for understanding 16 languages. He supported an opinion, that the German and Persian languages were derived from the same origin. His Latin translation of the Tablet of Cebes, with the Arabic version and the Greek, was printed at Leyden in 1640, under the care of Salmasius, who prefixed thereto a very ample preface.

ELIQUATION, in chemistry, an operation by which a more fusible substance is separated from one that is less so, by means of a heat sufficiently intense to melt the former, but not the latter. Thus an alloy of copper and lead may be separated by a heat capable of melting the latter, but not the former.

ELIS. See ELEE.

ELIS, (anc. geog.), the capital of the district of that name in Peloponnesus, situated on the Peneus, which ran through it. It was the country of Phædo the philosopher, scholar of Socrates, and friend of Plato; who inscribes with his name the dialogue on the im-

mortality of the soul. Pyrrho also was of this city, at the head of the sect called after him *Pyrrhonists*.

The city of Elis owed its origin to an union of small towns after the Persian war. It was not encompassed immediately with a wall; for it had the care of the temple at Olympia, and its territory was solemnly consecrated to Jupiter. To invade or not protect it was deemed impious; and armies, if marching through, delivered up their weapons, which, on their quitting it, were restored. Amid warring states the city enjoyed repose, was resorted to by strangers, and flourished. The region round about it was called *sale* or *hollow*, from the inequalities. The country was reckoned fertile, and particularly fit for the raising of flax. This, which grew no where else in Greece, equalled the produce of Judæa in fineness, but was not so yellow. Elis was a school, as it were, for Olympia, which was distant 37 miles. The athletic exercises were performed there, before the more solemn trial, in a gymnasium, by which the Peneus ran. The hellanodics or prefects of the games paired the rival combatants by lot, in an area called *Plethrum* or *The Acra*. Within the wall grew lofty plane-trees; and in the court, which was called the *Xylus*, were separate courses marked for the foot-races. A smaller court was called the *Quadrangle*. The prefects, when chosen, resided for 10 months in a building erected for their use, to be instructed in the duties of their office. They attended before sun-rise to preside at the races; and again at noon, the time appointed for the pentathlon or five sports. The horses were trained in the agora or market-place, which was called the *Hippodrome*. In the gymnasium were altars and a cenotaph of Achilles. The women, besides other rites, beat their bosoms in honour of this hero, on a fixed day toward sunset. There also was the town-hall, in which extemporary harangues were spoken and compositions recited. It was hung round with bucklers for ornaments. A way led from it to the baths through the Street of Silence; and another to the market-place, which was planned with streets between porticoes of the Doric order adorned with altars and images. Among the temples one had a circular peristyle or colonnade; but the image had been removed and the roof was fallen in the time of Pausanias. The theatre was ancient, as was also a temple of Bacchus, one of the deities principally adored at Elis. Minerva had a temple in the citadel, with an image of ivory and gold made (it was said) by Phidias. At the gate leading to Olympia was the monument of a person, who was buried, as an oracle had commanded, neither within nor without the city. The structures of Elis, Dr Chandler observes, seem to have been raised with materials far less elegant and durable than the produce of the Ionian and Attic quarries. The ruins are of brick, and not considerable, consisting of pieces of ordinary wall, and an octagon building with niches, which, it is supposed, was the temple with a circular peristyle. These stand detached from each other, ranging in a vale southward from the wide bed of the river Peneus; which, by the margin, has several large stones, perhaps reliques of the gymnasium. The citadel was on a hill, which has on the top some remnants of wall.

ELISIA the prophet, famous for the miracles he performed, died about 830. B. C. See the Bible.

ELISION.

Elis.
Elisia.

Elision
Elizabeth.

ELISION, in grammar, the cutting off or suppressing a vowel at the end of a word, for the sake of sound or measure, the next word beginning with a vowel.

Elisions are pretty frequently met with in English poetry, but more frequently in the Latin, French, &c. They chiefly consist in suppressions of the *a, e,* and *i*, though an elision suppresses any of the other vowels.

ELIXATION, in pharmacy, the extracting the virtues of ingredients by boiling or stewing.

ELIXIR, in medicine, a compound tincture extracted from many efficacious ingredients. Hence the difference between a tincture and an elixir seems to be this, that a tincture is drawn from one ingredient, sometimes with an addition of another to open it and to dispose it to yield to the menstruum; whereas an elixir is a tincture extracted from several ingredients at the same time.

ELIZABETH, queen of England, daughter of Henry VIII. and Anna Boleyn, was born at Greenwich, September 7th, 1533. According to the humour of the times, she was early instructed in the learned languages, first by Grindal, who died when she was about 17, and afterwards by the celebrated Roger Ascham. She acquired likewise considerable knowledge of the Italian, Spanish, and French languages. Dr Grindal was also her preceptor in divinity, which she is said to have studied with uncommon application and industry. That Elizabeth became a Protestant, and her sister Mary a Papist, was the effect of that cause which determines the religion of all mankind; namely, the opinion of thoseby whom they were educated: and this difference of opinion, in their tutors, is not at all surprising, when we recollect, that their father Harry was of both religions, or of neither.

But the studies of Elizabeth were not confined merely to languages and theology: she was also instructed in the political history of the ancients; and was so well skilled in music, as to sing and play "artfully and sweetly."

After the short reign of her brother Edward, our heroine being then about 20 years of age, her *firebrand* sister ascending to the crown, Elizabeth experienced a considerable degree of persecution, so as to be not a little apprehensive of a violent death. She was accused of nobody knows what; imprisoned; and, we are told, inhumanly treated. At last, by the intercession of king Philip of Spain, she was set at liberty; which she continued to enjoy till, on the death of her *pious* sister, she, on the 17th of November 1558, ascended the throne of England. Her political history as a queen, is universally known and admired*: but her attention to the government of her kingdom did not totally suspend her pursuit of learning. Ascham, in his *Schoolmaster*, tells us, that about the year 1563, five years after her accession, she being then at Windsor, besides her perfect readiness in Latin, Italian, French, and Spanish, she read more Greek in one day than some prebendaries of that church did read Latin in a whole week, (p. 21.)—She employed Sir John Fortescue to read to her, Thucydides, Xenophon, Polybius, Euripides, Æschines, and Sophocles. (*Ballard*, p. 219.)—That the Latin language was familiar to her, is evident from her speech to the university of Oxford,

when she was near sixty; also from her spirited answer Elizabeth. to the Polish ambassador in the year 1598. And that she was also skilled in the art of poetry appears, not only from the several scraps which have been preserved, but likewise from the testimony of a cotemporary writer, Puttenham, in his *Art of Engl. Poetry* (a very scarce book). These are his words:—"But, last in recital, "and first in degree, is the queen, whose learned, delicate, noble muse, easily surmounteth all the rest, "for sense, sweetness, or subtilty, be it in ode, elegy, epigram, or any other kind of poem," &c. In this author are to be found only a specimen of 16 verses of her English poetry. "But," says Mr Walpole, "a greater instance of her genius, and that too in "Latin, was her extempore reply to an insolent prohibition delivered to her from Philip II. by his ambassador, in this tetrastich.

Te vete ne pergas bello defendere Belgas:
Quæ Dracus eripuit, nunc reliquam ut oportet:
Quas pater evertit, jubeo te condere cecilas:
Religio pape fac restituatur ad unguem.

"She instantly answered him, with as much spirit
"as she used to return his invasions,"

Ad Græcas, bone rex, sient mandata kalendas.

Being earnestly pressed by a Romish priest, during his persecution, to declare her opinion concerning the real presence of Christ's body in the wafer, she answered,

Christ was the word that spake it;
He took the bread, and brake it;
And what that word did make it,
That I believe, and take it.

Foiler's Holy State.

She gave the characters of four knights of Nottinghamshire in the following distich:

Gervase the gentle, Stanhope the stout,
Markham the lion, and Sutton the lout.

Walp. Cat.

Coming into a grammar-school, she characterized three classic authors in this hexameter:

Perfusus a crab-staff; bawdy Martial; Ovid a fine wag.
Full. Worth. of Warw. 126.

Sir Walter Raleigh having wrote on a window,

Fair: would I climb, yet fear I to fall;
She immediately wrote under it,

If thy heart fail thee, climb not at all.

Worth. of Devonsh. 261.

Doubtless, she was a woman of singular capacity and extraordinary acquirements: and, if we could forget the story of the Scottish Mary, and of her favourite Essex, together with the burning of a few Anabaptists; in short, could we forbear to contemplate her character through the medium of religion and morality, we might pronounce her the most illustrious of illustrious women. See further, the articles ENGLAND, MARY, and SCOTLAND. She died in her palace at Richmond, the 24th of March 1602, aged 70, having reigned 44 years; and was interred in the chapel of Henry VII. in Westminster Abbey. Her successor James erected a magnificent monument to her memory.—She wrote, 1. The Mirror, or Glasse of the Sinful Soul. This was translated out of French verse into English

* See (History of) England,

Elizabeth
||
Elliot.

Elliot.

English prose, when he was eleven years old. It was dedicated to queen Catherine Parr. Probably it was never printed; but the dedication and preface are preserved in the *Sylloge epistolarum*, in Hearne's edition of *Livii Foro-Julienfis*, p. 161. 2. Prayers and Meditations, &c. Dedicated to her father, dated at Hatfield, 1545. Manuscript, in the royal library. 3. A Dialogue out of Xenophon, in Greek, between Hiero a King, yet some time a private person, and Simonides a Poet, as touching the life of the Prince and Private Man. First printed, from a manuscript in her majesty's own hand-writing, in the Gentleman's Magazine for 1743. 4. Two Orationes of Isocrates, translated into Latin. 5. Latin Oration at Cambridge. Preserved in the king's library: also in Hollinshed's Chron. p. 1206; and in Fuller's Hist. of Cambr. p. 138. 6. Latin Oration at Oxford. See Wood's Hist. and Antiq. of Oxf. lib. i. p. 289. also in Dr Jobb's Append. to his Life of Mary Queen of Scots. 7. A Comment on Plato. 8. *Boethius de consolatione philosophiæ*, translated into English anno 1593. 9. *Salust de bello Jugurthino*, translated into English anno 1590. 10. A play of Euripides, translated into Latin, Cat. of Royal Auth. 11. A Prayer for the use of her fleet in the great expedition in 1596. 12. Part of Horace's art of Poetry, translated into English, anno 1598. 13. *Plutarch de crigistate*, translated into English. 15. Letters on various occasions to different persons; several speeches to her parliament; and a number of other pieces.

ELIZABETH PETROWNA, (daughter of Peter the Great), the last empress of Russia, distinguished herself by her signal clemency. She made a vow, that no person should be put to death in her reign, and she strictly observed it. The example has been followed, and confirmed by law, under the present august sovereign of Russia, Catharine II. Elizabeth died in 1762, in the 21st year of her reign and 52d of her age.

ELK,
Elk-Anclopes, } in zoology. See CERVUS.

ELL, a measure of length, different in different countries: but those mostly used are the English and Flemish ells; whereof the former is three feet nine inches, or one yard and a quarter; and the latter only 27 inches, or three quarters of a yard. In Scotland, the ell contains $37\frac{1}{2}$ English inches.

ELLIOT, (the Right Honourable George Augustus, Lord Heathfield), was the youngest son of the late Sir Gilbert Elliot, Baronet of Stobbs (A) in Roxburghshire, and was born about the year 1718. He received the first rudiments of his education under a private tutor; and at an early time of life was sent to the university of Leyden, where he made considerable progress in classical learnings; and spoke with flu-

ency and elegance the German and French languages. Being designed for a military life, he was sent from thence to the celebrated *Ecole Royale du Genie Militaire*, conducted by the great Vauban, at La Fere in Picardy; where he laid the foundation of what he so conspicuously exhibited at the defence of Gibraltar. He completed his military course on the continent by a tour, for the purpose of seeing in practice what he had studied in theory. Prussia was the model for discipline, and he continued some time as a volunteer in that service.

Mr Elliot returned in the 17th year of his age to his native country, Scotland; and was the same year, 1735, introduced by his father Sir Gilbert, to Lieutenant-Colonel Peers of the 23d regiment of foot, then lying at Edinburgh, as a youth anxious to bear arms for his king and country. He was accordingly entered as a volunteer in that regiment, where he continued for a year or more. From the 23d regiment he went into the engineer corps at Woolwich, and made great progress in that study, until his uncle Colonel Elliot brought him in his adjutant of the second troop of horse grenadiers. With these troops he went upon service to Germany, and was with them in a variety of actions. At the battle of Dettingen he was wounded. In this regiment he bought the rank of captain and major, and afterwards purchased the lieutenant-colonelcy from Colonel Brewerton, who succeeded to his uncle. On arriving at this rank, he resigned his commission as an engineer, which he had enjoyed along with his other rank, and in which service he had been actively employed very much to the advantage of his country. He received the instructions of the famous engineer Belidor, and made himself completely master of the science of gunnery. Had he not so disinterestedly resigned his rank in the engineer department, he would long before his death, by regular progression, have been at the head of that corps. Soon after this he was appointed aid-de-camp to George II. and was distinguished for his military skill and discipline. In the year 1759, he quitted the second troop of horse grenadier guards, being selected to raise, form, and discipline, the first regiment of light horse, called after him *Elliot's*. As soon as they were raised and formed, he was appointed to the command of the cavalry in the expedition on the coasts of France, with the rank of brigadier general. After this he passed into Germany, where he was employed on the staff, and greatly distinguished himself in a variety of movements; where his regiment displayed a strictness of discipline, an activity and enterprise, which gained them signal honour: and indeed they have been the pattern regiment, both in regard to discipline and appointment, to the many light dragoon troops that have been since

(A) The ancient and honourable family of Elliot of Stobbs, as well as the collateral branch of Elliot of Minto in the same county, and of Elliot of Port-Elliot, in Cornwall, who are originally from Normandy. Their ancestor, Mr Aliott, came over with William the Conqueror, and held a distinguished rank in his army. There is a traditional anecdote in the family relating to an honourable distinction in their coat, which, as it corresponds with history, bears the probability of truth. When William set foot on English land, he slipped and fell on the earth. He sprang up and exclaimed that it was a happy omen—he had embraced the country of which he was to become the lord. Upon this Aliott drew his sword, and swore by the honour of a soldier, that he would maintain, at the hazard of his blood, the right of his lord to the sovereignty of the earth which he had embraced. On the event of conquest, King William added to the arms of Aliott, which was a baton or, on a field azure, an arm and sword as a crest, with the motto, *Per saxa per ignes, fortiori de celsis*.

Elliot.

Since raised in our service. From Germany he was recalled for the purpose of being employed as second in command in the memorable expedition against the Ilavannah; the circumstances of which conquest are well known.

On the peace his gallant regiment was reviewed by the king, when they presented to his majesty the standards which they had taken from the enemy. Gratiified with their fine discipline and high character, the king asked General Elliot what mark of his favour he could bestow on his regiment equal to their merit? He answered, that his regiment would be proud if his majesty should think, that, by their services, they were intitled to the distinction of *Royals*. It was accordingly made a royal regiment, with this flattering title, "The 15th, or *King's* Royal Regiment of Light Dragoons." At the same time the king expressed a desire to confer some honour on the general himself; but the latter declared, that the honour and satisfaction of his Majesty's approbation of his services was his best reward.

During the peace he was not idle. His great talents in the various branches of the military art gave him ample employment. In the year 1775, he was appointed to succeed General A'Court as commander in chief of the forces in Ireland; but did not continue long in this station, not even long enough to unpack all his trunks: for finding that interferences were made by petty authority derogatory of his own, he resisted the practice with becoming spirit; and not choosing to disturb the government of the sister kingdom on a matter personal to himself, he solicited to be recalled. He accordingly was so, and appointed to the command of Gibraltar in a fortunate hour for the safety of that important fortress. The system of his life, as well as his education, peculiarly qualified him for this trust. He was perhaps the most abstemious man of the age; never indulging himself in animal food nor wine. He never slept more than four hours at a time; so that he was up later and earlier than most other men. He so injured himself to habits of hardiness, that the things which are difficult and painful to other men, were to him his daily practice, and rendered pleasant by use. It could not be easy to starve such a man into a surrender, nor easy to surprise him. The example of the commander in chief in a besieged garrison had a most persuasive efficacy in forming the manners of the soldiery. Like him his brave followers came to regulate their lives by the most strict rules of discipline before there arose a necessity for so doing; and severe exercise, with short diet, became habitual to them by their own choice. The military system of discipline which he introduced, and the preparations which he made for his defence, were contrived with so much judgment, and executed with so much address, that he was able with a handful of men to preserve his post against an attack, the constancy of which, even without the vigour, had been sufficient to exhaust any common set of men. Collected within himself, he in no instance destroyed, by premature attacks, the labours which would cost the enemy time, patience, and expence to complete; he deliberately observed their approaches, and seized on the proper moment, with the keenest perfection, in which to make his attack with success. He never spent his ammunition in useless parade or in unimportant attacks. He never relaxed

N^o 114.

Elliot.

from his discipline by the appearance of security, nor hazarded the lives of his garrison by wild experiments. By a cool and temperate demeanour, he maintained his station for three years of constant investment, in which all the powers of Spain were employed. All the eyes of Europe were on this garrison; and his conduct has justly exalted him to the most elevated rank in the military annals of the day. On his return to England, the gratitude of the British senate was as forward as the public voice in giving him that distinguished mark his merit deserved. Both houses of parliament voted an unanimous address of thanks to the general. The king conferred on him the honour of Knight of the Bath, with a pension during his own and a second life of his own appointment; and on June 14. 1787, his majesty advanced him to the peerage by the title of *Lord Heathfield Baron Gibraltar*, permitting him to take in addition to his family arms, the arms of the fortress he had so bravely defended, to perpetuate to futurity his noble conduct.

His lordship died on the 6th of July 1790, at his chateau at Aix-la-Chapelle, of a second stroke of the palsy, after having for some weeks preceding enjoyed tolerable good health and an unusual flow of spirits. His death happened two days before he was to have set out for Leghorn in his way to Gibraltar; of which place he was once more appointed to the defence in the view of an approaching war.—He married Anne, daughter of Sir Francis Drake of Devonshire; and had by her (who died in 1769) Francis-Augustus, now Lord Heathfield, lieutenant-colonel of the 6th regiment of horse.—It is not quite certain whether the late lord has left a dowager lady. We are told, in a public newspaper, "that he closed a life of military renown at the most critical season for his memory. He had acquired the brightest honours of a soldier, the love and reverence of his country; and he fell in an exertion beyond his strength, from an anxiety to close his life on the rock where he had acquired his greatest fame. Even the last efforts of his age and decay were in him proofs of a noble mind; for after he had wasted his strength in the service of his country, he devoted his last act to private gratitude. The day of his death was actually fixed for the day of his marriage, from an endearing wish that the object of his youthful love might be the relic of his honoured age, and that he might exalt to the rank of a British peeress the tender and affectionate female, who, in a foreign island, had soothed him on the bed of sickness."—Another account says, "He has left his pension of 2000 l. per annum (which he was impowered by the crown to dispose of to any second life he thought proper) to his long-beloved Irish mistress, to whom it is said he was married at Aix-la-Chapelle a short time before his decease."—A third says, also, that "he was married, and that he has settled a jointure of 400 l. on his lady, and bequeathed the remainder of his fortune to his son."—But by a fourth we are informed, that he "has left by his will to J. Trayton Fuller, Esq; who married his daughter, 20,000 l.; and to Lieutenant Kockler of the artillery, 600 l.; and to Mr Mackay his secretary, 400 l. The rest and residue to his son, now Lord Heathfield. In the will there is no bequest to, nor any mention made of, a young lady to whom it had been stated his lordship was about to be married and had left an ample fortune to."

ELLIPSIS,

ELLIPSIS, in geometry, a curve line returning into itself, and produced from the section of a cone by a plane cutting both its sides, but not parallel to the base. See *Conic Sections*.

ELLIPSIS, in grammar, a figure of syntax, wherein one or more words are not expressed; and from this deficiency it has got the name *ellipsis*.

ELLIPTIC, or **ELLIPTICAL**, something belonging to an ellipse.

ELLIPOMACHROSTYLA, in natural history, a genus of imperfect crystals, with single pyramids; one end of their column being affixed to some solid body. They are dodecahedral, with hexangular columns and hexangular pyramids.

Of these crystals authors enumerate a great many species; among which are the whitish pelucid sprig crystal, a bright brown kind, a dull brown kind, and a bright yellow kind; all which are farther distinguished according to the different lengths of their pyramids.

ELLIPOACRYSTYLA, in natural history a genus of imperfect crystals, composed of 12 planes, in an hexangular column, terminated by an hexangular pyramid at one end, and irregularly affixed to some other body at the other, with shorter columns.

There are two species of these crystals; one short, bright, and colourless, found in great plenty in New Spain and other parts of America; the other, a short, dull, and dusky brown one, found in Germany, and sometimes in England.

ELLISIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 28th order, *Luride*. The corolla is monopetalous and funnel-shaped; the berry carnosous and bilocular; there are two seeds mucicated or set with small raised points, the one higher than the other.

ELM, in botany. See *ULMUS*.

ELMACINUS (George), author of a *History of the Saracens*, was born in Egypt towards the middle of the 13th century. His history comes down from Mahomet to the year of the Hegira 512, answering to the year of our Lord 1134; in which he sets down year by year, in a very concise manner, whatever regards the Saracen empire, intermixed with some passages relating to the eastern Christians. His abilities must have been considerable; since, though he professed Christianity, he held an office of trust near the persons of the Mahometan princes. He was son to Yaser Al Amid, secretary to the council of war under the sultans of Egypt for 45 years; and in 1238, when his father died, succeeded him in his place. His history of the Saracens was translated from Arabic into Latin by Erpinus; and printed in these two languages in folio, at Leyden, in 1625. Erpinus died before the publication; but Golius took care of it, and added a preface. It was dedicated by Erpinus's widow to Dr Andrews, bishop of Winchester.

ELOCUTION. See *ORATORY*, Part III.

ELOGY, a praise or panegyric bestowed on any person or thing, in consideration of its merit. The beauty of elogy consists in an expressive brevity. Eulogiums should not have so much as one epithet, properly so called, nor two words synonymous: they

should strictly adhere to truth; for extravagant and improbable elogies rather lessen the character of the person or thing they would extol.

ELOHI, *Eloi*, or *Elohim*, in scripture, one of the names of God. But it is to be observed, that angels, princes, great men, judges, and even false gods, are sometimes called by this name. The sequel of the discourse is what afflicts us in judging rightly concerning the true meaning of this word. It is the same as *Eloha*. One is the singular, the other the plural. Nevertheless *Elohim* is often constructed in the singular number, particularly when the true God is spoken of; but when false gods are spoke of, it is construed rather in the plural.

ELOINED, in law, signifies restrained or hindered from doing something: thus it is said, that if those within age be eloiued, so that they cannot sue personally, their next friend shall sue for them.

ELONGATION, in astronomy, the digression or recess of a planet from the sun, with respect to an eye placed on our earth. The term is chiefly used in speaking of Venus and Mercury, the arch of a great circle intercepted between either of these planets and the sun being called the *elongation* of that planet from the sun.

ELONGATION, in surgery, is an imperfect luxation, occasioned by the stretching or lengthening of the ligaments of any part.

ELOPEMENT, in law, is where a married woman departs from her husband, and cohabits with an adulterer; in which case the husband is not obliged to allow her any alimony out of his estate, nor is he chargeable for necessaries for her of any kind. However, the bare advertising a wife in the gazette, or other public paper, is not a legal notice to persons in general not to trust her; though a personal notice given by the husband to particular persons is said to be good.—An action lies, and large damages may be recovered, against a person for carrying away and detaining another man's wife.

ELOQUENCE, the art of speaking well, so as to affect and persuade. See *ORATORY*.

ELSHEIMER (Adam), a celebrated painter, born at Francfort on the Maine, 1574. He was first a disciple of Philip Uffenbach a German; but his desire of improvement carrying him to Rome, he soon became a most excellent artist in landscapes, history, and night-pieces, with small figures. His works are but few; and the great pains he bestowed in finishing them raised their prices so high, that they are hardly any where to be found but in the cabinets of princes. He was of a melancholy turn, and sunk under the embarrassments of his circumstances in 1610. James Enest Thomas of Landau was his disciple; and imitated his style so nicely, that their performances are not easily distinguished.

ELSIMBURG, a port-town of Sweden, in the province of Gothland, and territory of Schonen, seated on the side of the Sound, over against Elfsnöre. It was formerly a fortress belonging to the Danes; but all the fortifications were demolished in 1679, and there is only one tower of a castle which remains undemolished. It now belongs to Sweden. E. Long. 13. 20. N. Lat. 56. 2.

Elisnore,
Elvas.

ELSINORE, or **ELSINÖR**, a port-town of Denmark, seated on the Sound, in the isle of Zealand. E. Long. 13. 23. N. Lat. 56. 0.—It was a small village, containing a few fishermen's huts, until 1445, when it was made a staple town by Eric of Pomerania; who conferred upon the new settlers considerable immunities, and built a castle for their defence. From that period it gradually increased in size and wealth, and is now the most commercial place in Denmark next to Copenhagen. It contains about 5000 inhabitants, amongst whom are a considerable number of foreign merchants, and the consuls of the principal nations trading to the Baltic. The passage of the Sound is guarded by the fortrefs of Cronborg, which is situated upon the edge of a peninsular promontory, the nearest point of land from the opposite coast of Sweden. It is strongly fortified towards the shore by ditches, bastions, and regular entrenchments; and towards the sea by several batteries, mounted with 60 cannon, the largest whereof are 48 pounders. Every vessel, as it passes, lowers her top-sails, and pays a toll at Elisnore. It is generally asserted, that this fortrefs guards the Sound; and that all the ships must, on account of the shoal waters and currents, steer so near the batteries as to be exposed to their fire in case of refusal. This, however, is a mistaken notion: On account indeed of the numerous and opposite currents in the Sound, the safest passage lies near the fortrefs; but the water in any part is of sufficient depth for vessels to keep at a distance from the batteries, and the largest ships can even sail close to the coast of Sweden. The constant discharge, however, of the toll, is not so much owing to the strength of the fortrefs as to a compliance with the public law of Europe. Many disputes have arisen concerning the right by which the crown of Denmark imposes such a duty. The kings of Sweden, in particular, claiming an equal title to the free passage of the Strait, were for some time exempted by treaty from paying it; but in 1720, Frederic I. agreed that all Swedish vessels should for the future be subject to the usual imposts. All vessels, beside a small duty, are rated at 1½ per cent. of their cargoes, except the English, French, Dutch, and Swedish, which pay only one per cent. and in return, the crown takes the charge of constructing light-houses, and erecting signals to mark the shoals and rocks, from the Categate to the entrance into the Baltic. The tolls of the Sound, and of the two Belts, supply an annual revenue of above L. 100,000.

ELVAS, a large town, and one of the best and most important in Portugal, seated in the province of Alentejo, a few miles from the frontiers of Estramadura in Spain. It is built on a mountain, and is strongly fortified with works of free-stone. The streets of the town are handsome, and the houses neat; and there is a cistern so large, that it will hold water enough to supply the whole town six months. The water is conveyed to it by a magnificent aqueduct, three miles in length, sustained in some places by four or five high arches, one upon another. It was bombarded by the French and Spaniards in 1706, but without effect. It has generally a garrison of 1000 men. The king founded an academy here, in 1733, for young gentlemen. W. Long. 7. 28. N. Lat.

58. 39

ELUDING, the act of evading or rendering a thing vain and of no effect; a dexterous getting clear, or escaping out of an affair, difficulty, embarrassment, or the like. We say, to *elude* a proposition, &c. The design of chicanery is, to *elude* the force of the laws: this doctor has not resolved the difficulty, but *eluded* it. Alexander, says the historian, in cutting the Gordian knot, either *eluded* the oracle or fulfilled it: *Ille nequiquam huiusmodi cum latentibus nodis, Nihil, inquit, interest, quomodo solvatur; gladioque ruptis omnibus loris, o-raculi fortem vel eludit, vel implevit.*

ELVELA, in botany: A genus of the natural order of fungi, belonging to the cryptogamia class of plants. The fungus is turbinate, or like an inverted cone.

ELUL, in ancient chronology, the 12th month of the Jewish civil year, and the sixth of the ecclesiastical: it consisted of only 29 days, and answered pretty nearly to our August.

ELUTRIATION, in chemistry, an operation performed by washing solid substances with water, stirring them well together, and hastily pouring off the liquid, while the lighter part remains suspended in it, that it may thereby be separated from the heavier part. By this operation metallic ores are separated from earth, stones, and other unmetallic particles adhering to them.

ELY, a city and bishop's see of Cambridgeshire, situated about 12 miles north of Cambridge. E. Long. 15. 0. N. Lat. 52. 24. It is a county of itself, including the territory around; and has a judge who determines all causes civil and criminal within its limits. The church hath undergone various alterations since it was first established by Etheldra, the wife of Egfride, king of Northumberland, who founded a religious house here, and planted it with virgins, and became the first abbess of it herself. The Danes entirely ruined this establishment; then Ethelwald, the 27th bishop of Winchester, rebuilt the monastery, and filled it with monks; to whom king Edgar, and many succeeding monarchs, bestowed many privileges, and great grants of land; so that this abbey became in process of time the best of any in England. Richard, the 11th abbot, wishing to free himself of the bishop of Lincoln, within whose diocese his monastery was situated, and not liking so powerful a superior, he made great interest with king Henry I. to get Ely erected into a bishoprick; and spared neither purse nor prayers to bring this about. He even brought the bishop of Lincoln to consent to it, by giving him and his successors the manors of Bugdon, Biggleswade, and Spalding, which belonged to the abbey, in lieu of his jurisdiction; but he lived not to taste the sweets of his industry and ambition, he dying before his abbey was erected into a see. His successor was the first bishop of Ely: but the great privileges the bishop enjoyed were almost wholly taken away, or much restricted, by the act of parliament, 27th Henry VIII. regarding the restoring to the crown the ancient royalties: So, instead of being palatine of the isle of Ely, the bishop and his temporal steward were by that act declared to be from thenceforth justices of the peace in the said island. This diocese contains all Cambridgeshire, and the isle of Ely, excepting Litcham, which belongs to the see of Rochester, and 15 other parishes, that are in the diocese of Norwich; but it has a parish in Norfolk,

Eluding—
Ely.

Elymais

Elym.

Elym.

folk, viz. Emeth. The number of parishes in this diocese are 141, whereof 75 are inappropriate. It hath but one archdeacon, viz. of Ely. It is valued in the king's books at L.2134 : 18 : 5. The clergy's tenth, amounting to the sum of L.384 : 14 : 9½. The bishopric is computed to be worth annually L.4000. The church is dedicated to St Etheldred. The building, as it now appears, has been the work of several of its bishops. The west parts were rebuilt by bishop Ridal; the choir and lantern were begun by bishop Norwold, and finished by bishop Frodsham. This see hath given two saints and two cardinals to the church of Rome; and to the English nation nine lord chancellors, seven lord treasurers, one lord privy-seal, one chancellor of the exchequer, one chancellor to the university of Oxford, two masters of the rolls, and three almoners. To this cathedral belong a bishop, a dean, an archdeacon, eight prebendaries, with vicars, lay-clerks, choristers, a schoolmaster, usher, and 28 king's scholars.

ELYMAIS, the capital city of the land of Elam, or the ancient Persia. We are told (1 Mac. vi. 1.) that Antiochus Epiphanes, having understood that there were very great treasures lodged in a temple at Elymais, determined to go and plunder it: but the citizens getting intelligence of his design, made an insurrection, forced him out of the city, and obliged him to fly. The author of the second book of Maccabees (ix. 2.) calls this city *Persepolis*, in all probability because formerly it was the capital of Persia: for it is known from other accounts, that Persepolis and Elymais were two very different cities, the latter situated upon the Euleus, the former upon the Araxis.

ELYMUS, in botany: A genus of the digynia order, belonging to the triandria class of plants; and in the natural method ranking under the fourth order, *Gramina*. The calyx is lateral, bivalved, aggregate, and multiflorous.

ELYOT (Sir Thomas), a gentleman of eminent learning in the 16th century, was educated at Oxford, travelled into foreign countries, and upon his return was introduced to court. His learning recommended him to Henry VIII. who conferred the honour of knighthood on him, and employed him in several embassies; particularly in 1532, to Rome, about the divorce of queen Catharine, and afterwards to Charles V. about 1536. He wrote, *The Castle of Health*, *The Governor*, *Banquet of Sapience*, *Of the Education of Children*, *De rebus memorabilibus Angliæ*, and other books; and was highly esteemed by all his learned cotemporaries.

ELYSIUM, (ÆLÏSIÛS,) in the ancient theology, or rather mythology, a place in the *inferi* or lower world, furnished with fields, meads, agreeable woods, groves, shades, rivers, &c. whither the souls of good people were supposed to go after this life.

Orpheus, Hercules, and Æneas, are supposed to have descended into Elysium in their life-time, and to have returned again; (Virg. lib. vi. ver. 638, &c.) Tibullus (lib. i. eleg. 3.) gives us fine descriptions of the Elysian fields.

Virgil opposes Elysium to Tartarus; which was the place, where the wicked underwent their punishment.

*Hic locus est, pariter ubi se via findit in ambas:
Dextera, quæ Ditis magni sub mœnia tendit;
Hæc iter Elysium nobis: at læva malorum
Exercent pœnas, & ad impia Tartara mittit.*

He assigns Elysium to those who died for their country, to those of pure lives, to truly inspired poets, to the inventors of arts, and to all who have done good to mankind.

Some authors take the fable of Elysium to have been borrowed from the Phœnicians; as imagining the name *Elysium* formed from the Phœnician *על אלז*, or *על אלז*, or *על אלז*, "to rejoice," or "to be in joy;" the letter *a* being only changed into *e*, as we find done in many other names; as in *Enakim* for *Anakim*, &c. On which footing, Elysian fields should signify the same thing as a place of pleasure; or,

— *Locus lætus, & amœna virescens
Fortunatorum memorum, sedique beatas.*

Virg.

Others derive the word from the Greek *ελευθερος*, "I deliver, I let loose or disengage;" because here mens souls are freed or disincumbered from the fetters of the body. Beroaldus, and Hornius (Hist. Philosoph. lib. iii. cap. 2.) take the place to have derived its name from Eliza, one of the first persons who came into Greece after the deluge, and the author and father of the Ætolians.

The Elysian fields were, according to some, in the Fortunate Islands on the coast of Africa; in the Atlantic. Others place them in the island of Leuce; and according to the authority of Virgil, they were situated in Italy. According to Lucian, they were near the moon; or in the centre of the earth, if we believe Plutarch. Olaus Wormius contends that it was in Sweden the Elysian fields were placed.

ELZEVIUS, celebrated printers at Amsterdam and Leyden, who greatly adorned the republic of letters by many beautiful editions of the best authors of antiquity. They fell somewhat below the Stephanes in point of learning, as well as in their editions of Greek and Hebrew authors; but as to the choice of good books, they seem to have equalled, and in the neatness and elegance of their small characters, greatly to have exceeded them. Their Virgil, Terence, and Greek Testament, have been reckoned their masterpieces; and are indeed so very fine, that they justly gained them the reputation of being the best printers in Europe. There were five of these Elzevirs, namely, Lewis, Bonaventure, Abraham, Lewis, and Daniel. Lewis began to be famous at Leyden in 1595, and was remarkable for being the first who observed the distinction between the *v* consonant and *u* vowel, which had been recommended by Ramus and other writers long before, but never regarded. Daniel died in 1680 or 1681; and though he left children who carried on the business, passes nevertheless for the last of his family who excelled in it. The Elzevirs have printed several catalogues of their editions; but the last, published by Daniel, is considerably enlarged, and abounds with new books. It was printed at Amsterdam, 1674, in 12mo, and divided into seven volumes.

EMANATION, the act of flowing or proceeding from some source or origin. Such is the emanation of

Elysiûm

Elysiûm

Emanation.

Emanation light from the sun; or that of effluvia from odorous, &c. bodies; of wisdom from God, &c.—The word is formed of the Latin *e* “out of,” and *manare* “to flow or stream.”

Embalming

EMANATION is also used for the thing that proceeds, as well as the act of proceeding. The power given a judge is an emanation from the regal power; the reasonable soul is an emanation from the Divinity.

EMANCIPATION, in the Roman law, the setting free a son from the subjection of his father; so that whatever moveables he acquires belong in property to him, and not to his father, as before emancipation.

Emancipation puts the son in a capacity of managing his own affairs, and of marrying without his father's consent, though a minor. Emancipation differs from manumission, as the latter was the act of a master in favour of a slave, whereas the former was that of a father in favour of his son.

There were two kinds of emancipation: the one tacit, which was by the son's being promoted to some dignity, by his coming of age, or by his marrying, in all which cases he became his own master of course. The other, express; where the father declared before a judge, that he emancipated his son. In performing this, the father was first to sell his son imaginarily to another, whom they called *pater fiduciarius*, father in trust; of whom being bought back again by the natural father, he manumitted him before the judge by a verbal declaration.

Emancipation still obtains in France with regard to minors or pupils, who are hereby set at liberty to manage their own effects, without the advice or direction of their parents or tutors.

EMARGINATED, among botanists. See **BOTANY**, p. 444, n° 181.

EMASCULATION, the act of castrating or depriving a male of those parts which characterise his sex. See **CASTRATION**, and **EUNUCH**.

EMAUS, **EMMAUS**, or **AMMAUS**, (anc. geog.), a village, 60 stadia to the north-west of Jerusalem, or about seven miles: it afterwards became a town, and a Roman colony, *Nicopolis*, (Jerome). Reland has another *Emmaus* towards Lydda, 22 miles from Jerusalem, (Itiner-ry); a third, near Tiberias.

EMBALMING, is the opening a dead body, taking out the intestines, and filling the place with odoriferous and delicate drugs and spices, to prevent its putrifying. The Egyptians excelled all other nations in the art of preserving bodies from corruption; for some that they have embalmed upwards of 2000 years ago, remain whole to this day, and are often brought into other countries as great curiosities. Their manner of embalming was thus: they scooped the brains with an iron scoop out at the nostrils, and threw in medicaments to fill up the vacuum: they also took out the entrails, and having filled the body with myrrh, cassia, and other spices, except frankincense, proper to dry up the humours, they pickled it in nitre, where it lay soaking for 70 days. The body was then wrapped up in bandages of fine linen and gums, to make it stick like glue; and so was delivered to the kindred of the deceased, entire in all its features, the very hairs of the eye-lids being preserved. They used

to keep the bodies of their ancestors, thus embalmed, in little houses magnificently adorned, and took great pleasure in beholding them, alive as it were, without any change in their size, features, or complexion: The Egyptians also embalmed birds, &c. The prices for embalming were different; the highest was a talent, the next 29 minæ, and so decreasing to a very small matter: but they who had not wherewithal to answer this expence, contented themselves with infusing, by means of a syringe, through the fundament, a certain liquor extracted from the cedar; and, leaving it there, wrapped up the body in salt of nitre: the oil thus preyed upon the intestines, so that when they took it out, the intestines came away with it, dried, and not in the least putrified: the body being enclosed in nitre, grew dry, and nothing remained besides the skin glued upon the bones.

The method of embalming used by the modern Egyptians, according to Maillet, is to wash the body several times with rose-water, which, he elsewhere observes, is more fragrant in that country than with us; they afterwards perfume it with incense, aloes, and a quantity of other odours, of which they are by no means sparing; and then they bury the body in a winding sheet, made partly of silk and partly of cotton, and moistened, as is supposed, with some sweet-scented water or liquid perfume, though Maillet uses only the term *moistened*; this they cover with another cloth of unmix'd cotton, to which they add one of the richest suits of clothes of the deceased. The expence, he says, on these occasions, is very great, though nothing like what the genuine embalming cost in former times.

EMBARCADERO, in commerce, a Spanish term, much used along the coasts of America, particularly those on the side of the South Sea. It signifies a place which serves some other considerable city farther within land, for a port or place of shipping, *i. e.* of embarking and disembarking commodities. Thus Calao is the embarcadero of Lima, the capital of Peru; and Arica the embarcadero of Potosi. There are some embarcaderos 40, 50, and even 60 leagues off the city, which they serve in that capacity.

EMBARGO, in commerce, an arrest on ships or merchandise, by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of port, sometimes to prevent their coming in, and sometimes both, for a limited time.

The king may lay embargoes on ships, or employ those of his subjects, in time of danger, for the service and defence of the nation: but they must not be for the private advantage of a particular trader or company; and therefore a warrant to stay a single ship is no legal embargo. No inference can be made from embargoes which are only in war-time; and are a prohibition by advice of council, and not at prosecution of parties. If goods be laden on board, and after an embargo or restraint from the prince or state comes forth, and then the master of the ship breaks ground, or endeavours to sail, if any damage accrues, he must be responsible for the same; the reason is, because his freight is due, and must be paid, even tho' the goods be seized as contraband.

Embarcadero, Embargo.

Embarraſs
||
Emberiza.

EMBARASS, (*Embarraſſement*), a French term, though now naturalized; denoting a difficulty or obſtacle which perplexes or confounds a perſon, &c.

EMBASSADOR. See AMBASSADOR.

EMBASSY, the office or function of an AMBASSADOR.

EMBDEN, a port-town and city of Germany, capital of a county of the ſame name, now in poſſeſſion of the king of Pruſſia; it is ſituated at the mouth of the river Ens. E. Long. 6. 45. N. Lat. 53. 50.

EMBER-WEEKS, are thoſe wherein the *ember* or *ember days* fall.

In the laws of king Alfred, and thoſe of Canute, thoſe days are called *ymbren*, that is, circular days, from whence the word was probably corrupted into *ember-days*: by the canonists they are called *quatuor anni tempora*, the four cardinal ſeaſons, on which the circle of the year turns: and hence Henſhaw takes the word to have been formed, viz. by corruption from *temper* of *tempora*.

The ember-days are, the Wedneſday, Friday, and Saturday, after Quadregima Sunday, after Whitſunday, after Holy-rod day in September, and after St Lucia's day in December: which four times anſwer well enough to the four quarters of the year, Spring, Summer, Autumn, and Winter.

Mr Somner thinks they were originally faſts, inſtituted to beg God's bleſſing on the fruits of the earth. Agreeably to which, Skinner ſuppoſes the word *ember* taken from the aſhes, *embers*, then ſtrewed on the head.

Theſe ember-weeks are now chiefly taken notice of, on account of the ordination of prieſts and deacons; becauſe the canon appoints the Sundays next ſucceeding the ember-weeks, for the ſolemn times of ordination: Though the biſhops, if they pleaſe, may ordain on any Sunday or holiday.

EMBERIZA, in ornithology, a genus of birds belonging to the order of paſſeres. The bill is conical, and the mandibles recede from each other towards the baſe; the inferior mandible has the ſides narrowed inwards, but the upper one is ſtill narrower. The moſt remarkable ſpecies are,

1. The nivalis, or great pyed mountain-finch of Ray, and the ſnow-bird of Edwards, has white wings, but the outer edge of the prime-feathers are black; the tail is black, with three white feathers on each ſide. Theſe birds are called in Scotland *ſnow-flakes*, from their appearance in hard weather and in deep ſnows. They arrive in that ſeaſon among the Cheviot-hills and in the Highlands in amazing ſlocks. A few breed in the Highlands, on the ſummit of the higheſt hills, in the ſame places with the *ptarmigans*; but the greateſt numbers migrate from the extreme north. They appear in the Shetland iſlands; then in the Orkneys; and multitudes of them often fall, wearied with their flight, on veſſels in the Pentland Frith. Their appearance is a certain fore-runner of hard weather, and ſtorms of ſnow, being driven by the cold from their common retreats. Their progreſs ſouthward is probably thus; Spitzbergen and Greenland, Hudſon's Bay, the Lapland Alps, Scandinavia, Iceland, the Ferroe Iſles, Shetland, Orkneys, Scotland, and the Chivot-hills. They viſit at that ſeaſon all parts of the northern hemisphere, Pruſſia, Auſtria, and Siberia. They arrive lean, and return fat. In Auſtria, they are caught and

fed with millet, and, like the ortolan, grow exceſſively fat. In their flights, they keep very cloſe to each other, mingle moſt confuſedly together, and fling themſelves collectively into the form of a ball; at which inſtant the fowler makes great havock among them.

2. The miliaris, or grey emberiza, is of a greyiſh colour, ſpotted with black in the belly, and the orbits are reddiſh. It is the bunting of Engliſh authors, and a bird of Europe.

3. The hortulana, or ortolan, has black wings; the firſt three feathers on the tail are white on the edges, only the two lateral are black outwardly. The orbits of the eyes are naked and yellow; the head is greeniſh, and yellow towards the inferior mandible. It feeds principally upon the paucik-graſs; grows very fat; and is reckoned a delicate morſel by certain epicures, eſpecially when fattened artificially. Theſe birds are found in ſeveral parts of Europe, but are not met with in Britain; are common in France and Italy, and ſome parts of Germany and Sweden, migrating from one to the other in ſpring and autumn; and in their paſſage are caught in numbers, in order to fatten for the table. This ſpecies will ſometimes ſing very prettily, and has been kept for that purpoſe. The ſong is not unlike that of the yellow-hammer, but ſiner and ſweeter. In ſome parts it makes the neſt in a low hedge; in others, on the ground. It is careleſſly conſtructed, not unlike that of the lark. The female lays four or five greyiſh eggs, and in general has two broods in a year.

The manner of fattening theſe birds for the table is as follows. They are taken and placed in a chamber lightened by lanterns; ſo that, not knowing the viciffitudes of day and night, they are not agitated by the change. Are fed with oats and millet; and grow ſo fat, that they would certainly die if not killed in a critical minute. They are a mere lump of fat; of a moſt exquisite taſte, but apt ſoon to ſatiate. Theſe birds receive both their Greek and Latin name from their food, the millet. Ariſtotle calls them *cynchromis*; and the Latins, *miliaria*. The latter kept and fattened them in their *ornithones*, or fowl-yards, as the Italians do at preſent; which the ancients conſtructed with the utmoſt magnificence, as well as convenience.

4. The citrinella, or yellow-hammer, has a blackiſh tail, only the two outward ſide-feathers are marked on the inner edge with a ſharp white ſpot. It is a bird of Europe, and comes about houſes in winter: it builds its neſt on the ground on meadows.

5. The ſchœniclas, or reed-fparrow, has a black head, a blackiſh-grey body, and a white ſpot on the quill-feathers. It inhabits marſhy places, moſt commonly among reeds, from which it takes its name. Its neſt is worthy of notice for the artful contrivance of it, being faſtened to four reeds, and ſuſpended by them like a hammock, about three feet above the water; the cavity of the neſt is deep, but narrow; and the materials are buſhes, fine bent, and hairs. It lays four or five eggs of a bliſh white, marked with irregular purpliſh veins, eſpecially on the larger end. It is a bird much admired for its ſong; and, like the nightingale, it ſings in the night.

6. The oryzivora, or rice-bunting, with the head and whole under ſide of the body black; hind part of the neck

Emberiza,
Emblem.

neck in some pale yellow, and in others white; coverts of the wings, and primaries, black, the last edged with white; part of the scapulars, lesser coverts of the wings, and rump, white; back black, edged with dull yellow; tail of the same colours, and each feather sharply pointed; the legs are red. The head, upper part of the neck, and back, of the female, is yellowish brown, spotted with black; the under part, of a dull yellow; the sides thinly streaked with black.

These birds inhabit in vast numbers the island of Cuba, where they commit great ravages among the early crops of rice, which precede those of Carolina. As soon as the crops of that province are to their palate, they quit Cuba, and pass over the sea, in numerous flights, directly north; and are very often heard in their passage by sailors frequenting that course. Their appearance is in September, while the rice is yet milky; and commit such devastations, that 40 acres of that grain have been totally ruined by them in a small time. They arrive very lean: but soon grow so fat, as to fly with difficulty; and, when shot, often burst with the fall. They continue in Carolina not much above three weeks, and retire by the time the rice begins to harden; going on to other parts, and staying in each only so long as the rice continues green. They come into Rhode Island and New York at the end of April, or the second week in May, frequenting the borders of fields, and live on insects, &c. till the maize is fit for their palate; when they begin by pecking holes in the sides of the husks, and after satiating themselves go on to another; which leaves room for the rain to get in, and effectually spoils the plants. They continue there during the summer, and breed; returning, as autumn approaches, to the southward. The males and females do not arrive together; the females come first.—They are esteemed to be the most delicate birds of those parts; and the male is said to have a fine note. This species is known in the country by the names of *bob lincoln* and *conquella*; likewise called by some the *white-backed maize-thief*.

There are above 50 other species; two of which, viz. the black-throated bunting a native of America, and the cinereous bunting an inhabitant of Canada, are figured on Plate CLXXXII. as specimens of the genus.

EMBLEM, a kind of painted ænigma, which, representing some obvious history, with reflections underneath, instructs us in some moral truth or other matter of knowledge. See *DEVISE*, *ÆNIGMA*, &c.

Such is that very significant image of Scævola holding his hand in the fire; with the words, *Agere et pati fortiter Romanum est*, "To do and suffer courageously is Roman."

The word is pure Greek, formed of the verb *ἐμβάλειν*, "to cast in, to insert." Suetonius relates, that Tiberius made the word be erased out of the decree of the Roman senate, because borrowed from another language.

The emblem is somewhat plainer and more obvious than the ænigma.—Gale defines emblem an ingenious picture, representing one thing to the eye, and another to the understanding.

The Greeks also gave the name *ΕΜΒΛΗΜΑΤΑ*, to inlaid or mosaic works, and even to all kinds of ornaments of vases, moveables, garments, &c. And

the Latins used *emblemata* in the same sense. Accordingly, Cicero reproaching Verres with the statues and æne wrought works he had plundered from the Sicilians, calls the ornaments fixed thereto (and which on occasion might be separated from them) *emblemata*. Add, that Latin authors frequently compare the figures and ornaments of discourse to these *emblemata*. Thus, an ancient Latin poet praising an orator, says, that all his words were ranged like the pieces in mosaic:

*Quam lepide dictus composuit, ut tessellæ omnes,
Arte pavimenti, atque emblemata verniculat.*

With us, emblem ordinarily signifies no more than a painting, basso-relievo, or other representation, intended to hold forth some moral or political instruction.

What distinguishes an emblem from a devise is, that the words of an emblem have a full complete sense of themselves; nay, all the sense and signification which they have together with the figure. But there is a yet further difference between emblem and devise: for a devise is a symbol appropriated to some person, or that expresses something which concerns him particularly; whereas an emblem is a symbol that regards all the world alike.

These differences will be more apparent, from comparing the emblem above quoted, with the device of a candle lighted, and the words *Facundo confusor*, "I waste myself in doing good." See *DEVISE*.

EMBOLISMUS, *ἐμβολισμός*, in chronology, signifies "intercalation." The word is formed of *ἐμβάλλειν*, "to insert."

As the Greeks made use of the lunar year, which is only 354 days, in order to bring it to the solar, which is 365 days, they had every two or three years an embolism, i. e. they added a 13th lunar month every two or three years, which additional month they called *embolimaus*, *ἐμβολισμῖος*, because inserted, or intercalated.

EMBOSSEING, or **IMBOSSEING**, in architecture and sculpture, the forming or fashioning works in relief, whether cut with a chisel or otherwise.

Embossing is a kind of sculpture, wherein the figures stick out from the plane whereon it is cut: and according as the figures are more or less prominent, they are said to be in alto, mezzo, or basso, relief; or high, mean, or low, relief. See *ENCHASING*.

EMBOTHRIUM, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants. There is no calyx; the corolla consists of four linear oblique petals; the stamina are four very short filaments; the antheræ are pretty large, oblong, and seated within the cavity of the petal. The pericarpium is a round unilocular follicle, sharpened at both ends; the seeds are four or five in number, egg-shaped, and compressed.

EMBRASURE, in architecture, the enlargement made of the aperture of a door or window, on the inside of the wall; its use being to give the greater play for the opening of the door or casement, or to admit the more light.

EMBROCATION, in surgery and pharmacy, an external kind of remedy, which consists in an irrigation of the part affected, with some proper liquor, as oils, spirits, &c. by means of a woollen or linen cloth, or a sponge, dipped in the same.

EMBROIDERY, a work in gold, or silver, or silk thread, wrought by the needle upon cloth, stuffs, or muslin,

Embolismos
Embroidery.

Embroidery
||
Emerald

muslin, into various figures. In embroidering stuffs, the work is performed in a kind of loom; because the more the piece is stretched, the easier it is worked. As to muslin, they spread it upon a pattern ready designed; and sometimes, before it is stretched upon the pattern, it is starched, to make it more easy to handle. Embroidery on the loom is less tedious than the other, in which, while they work flowers, all the threads of the muslin, both lengthwise and breadthwise, must be continually counted; but, on the other hand, this last is much richer in points, and susceptible of greater variety. Cloths too much milled are scarce susceptible of this ornament, and in effect we seldom see them embroidered. The thinnest muslins are left for this purpose; and they are embroidered to the greatest perfection in Saxony: in other parts of Europe, however, they embroider very prettily, and especially in France.

There are several kinds of embroidery: as, 1. Embroidery on the stamp; where the figures are raised and rounded, having cotton or parchment put under them to support them. 2. Low embroidery; where the gold and silver lie low upon the sketch, and are stitched with silk of the same colour. 3. Guimped embroidery: this is performed either in gold or silver; they first make a sketch upon the cloth, then put on cut vellum, and afterwards sew on the gold and silver with silk thread: in this kind of embroidery they often put gold and silver cord, tinsel, and spangles. 4. Embroidery on both sides; that which appears on both sides of the stuff. 5. Plain embroidery; where the figures are flat and even, without cords, spangles, or other ornaments.

By stat. 22. Geo. II. c. 36. no foreign embroidery, or gold and silver brocade, shall be imported, upon pain of being forfeited and burnt, and penalty of 100l. for each piece. No person shall sell, or expose to sale, any foreign embroidery, gold or silver thread, lace, fringe, brocade, or make up the same into any garment, on pain of having it forfeited and burnt, and penalty of 100l. All such embroidery, &c. may be seized and burnt; and the mercer, &c. in whose custody it was found, shall forfeit 100l.

EMBRUN, or AMBRUN, a city of Dauphiny, in France, near the confines of Piedmont. E. Long. 6. 6. N. Lat. 44. 35.

EMBRYO, in physiology, the first rudiments of an animal in the womb, before the several members are distinctly formed; after which period it is denominated a *fetus*. See GENERATION, and FETUS.

EMERALD, a genus of precious stones belonging to the order of siliceous earths. The word is derived, according to some, from the French *esmarade*, and that from the Latin *smaragdus*, signifying the same thing; by others it is said to be derived from the Italian *sméraldo*, or the Arabian *zomorrad*. According to Cronstedt the emerald is the softest of all the precious stones, though other naturalists place it the next after the diamond in this respect. It is perhaps the most beautiful of all the gems, and, according to Wallerius, when heated in the fire, changes its colour to a deep blue, and becomes phosphorent; but recovers its green colour when cold. When pulverised it has a white appearance, and, with borax, melts to a very thin and colourless glass. It becomes electric by being rubbed, and some have the property of the tourmalin, viz. of

being electrified by heat, and in that state attracting althes or other light substances; though the emeralds are less powerful than the tourmalin, and after having attracted the althes, they retain them without any signs of repulsion.

Pliny mentions twelve different kinds of these precious stones; though it appears, from the vast size of some of them, that they must have been only certain kinds of green spar, or other green stone, which at that time went under the name of *emerald* among the ancients. The true emerald is found only in very small crystals, from the size of $\frac{1}{4}$ th of an inch in diameter to that of a walnut. Theophrastus, however, mentions one four cubits long and three broad; likewise an obelisk composed of only four emeralds, the whole length being 40 cubits, and the breadth from four to two.

Engelstrom informs us, that the emeralds, in their rough or native state, consist of hexagonal columns mostly truncated at both ends; and that he had some in his possession, which in a gentle heat became colourless; but in a strong heat white and opaque, without any mark of fusion. Brunick distinguishes them into two classes. 1. The pale green emerald, which comes from the east and from Peru, the figure being that of an hexagonal truncated prism, and the basis a vein of white quartz. 2. The dark green emerald, which is also columnar, but very dark-coloured, striped longitudinally, and has little transparency. The points are generally broken off longitudinally, though Davila mentions one resembling a blunt triangular pyramid; and in the Imperial cabinet at Vienna, there is one with a five-sided pyramid. These are the emeralds which become electrical by heat; though all of them do not; and those which do so cannot be known but by actual experiment. The finest specimen of the former kind of emeralds is to be seen in the treasure of the holy chapel of Loretto, containing upwards of 100 of these precious stones great and small. A fellow to this was made by art, and both were presents to the king of Sicily, designed to represent two mount Calvaries.

Emeralds are distinguished by the jewellers into two kinds, the oriental and occidental. The true oriental emerald is very scarce, and at present only found in the kingdom of Cambay. So great indeed is the scarcity of them, that an opinion prevailed that there are no oriental emeralds. This opinion is adopted, among others, by Mr Bruce; who informs us, that he made an excursion to the island of emeralds in the Red Sea, and endeavours to show that there never were any emeralds but what came from America, and that those said to have been found in the East Indies were imported from that continent. It is probable indeed, that in former times any kind of crystal tinged of a green colour might be called an *emerald*, and hence the green cochle spar brought from Egypt may have obtained the name of *mother of emeralds*; but of late some emeralds have been brought from Cambay into Italy which greatly excelled those of America. The best emeralds of the western continent come from Peru, and are called *oriental* by the jewellers: some are found in Europe, principally in the duchy of Silesia in Germany.

Rough EMERALDS.—Those of the first and coarsest sort, called *plafmes*, for grinding, are worth 27 shillings sterling the marc, or 8 ounces. The demi-morillons, 81. sterl. per marc. Good morillons, which are only little pieces,

Emerald,

Emerald
||
Emerfon.

pieces, but of fine colour, from 131. to 151. per marc. Emeralds, larger than morillons, and called of the *third colour* or *fort*, are valued at from 501. to 601. the marc. Emeralds, called of the *second fort*, which are in larger and finer pieces than the preceding, are worth from 651. to 751. per marc. Lastly, those of the first colour, otherwise called *negres cartes*, are worth from 1101. to 1151.

EMERALDS ready cut, or polished and not cut, being of good stone, and a fine colour, are worth,

	L.	s.
Those weighing one caract, or four grains	0	10
Those of two caracts	1	7
Those of three caracts	2	5
Those of four caracts	3	10
Those of five caracts	4	10
Those of six caracts	7	10
Those of seven caracts	15	0
Those of eight caracts	19	0
Those of nine caracts	23	0
Those of ten caracts	33	0

To counterfeit EMERALDS: Take of natural crystal, four ounces; of red-lead, four ounces; verdegris, forty-eight grains; crocus martis, prepared with vinegar, eight grains: let the whole be finely pulverized and sifted; put this into a crucible, leaving one inch empty: lute it well, and put it into a potter's furnace, and let it stand there as long as they do their pots. When cold, break the crucible; and you will find a matter of a fine emerald colour, which, after it is cut and set in gold, will surpass in beauty an oriental emerald.

EMERSON, in physics, the rising of any solid above the surface of a fluid specifically heavier than itself, into which it had been violently immersed or thrust.

It is one of the known laws of hydrostatics, that a lighter solid being forced down into a heavier fluid, immediately endeavours to emerge; and that with a force or moment equal to the excess of weight of a quantity of the fluid above that of an equal bulk of the solid. Thus, if a solid be immersed in a fluid of double its specific gravity, it will emerge again till half its bulk or body be above the surface of the fluid.

EMERSON, in astronomy, is when the sun, moon, or other planet, begins to re-appear, after its having been eclipsed, or hid by the interposition of the moon, earth, or other body.

The difference of longitude is sometimes found by observing the immersions and emersions of the first of Jupiter's satellites. The immersions are observed from the time of Jupiter's being in conjunction with the sun to his opposition; and the emersion, from the opposition to the conjunction; which two intervals are usually six months a-piece, and divide the year between them. But when Jupiter is in conjunction with the sun, and 15 days before and afterwards, there is nothing to be observed; the planet, with his satellites, being then lost in the light of the sun.

EMERSON is also used when a star, before hid by the sun, as being too near him, begins to re-appear, and to get out of his rays.

EMERSON (William), a late eminent mathematician, was born in June 1707, at Hurworth, a village

No 115.

about three miles south of Darlington; at least it is certain that he resided here from his childhood. His father Dudley Emerfon was a tolerable proficient in mathematics; and without his books and instructions, perhaps his own genius (most eminently fitted for mathematical disquisitions) would have never been unfolded. He was instructed in the learned languages by a young clergyman, then curate of Hurworth, who was boarded at his father's house. In the earlier part of his life he attempted to teach a few scholars: but whether from his concise method (for he was not happy in explaining his ideas), or the warmth of his natural temper, he made no progress in his school: he therefore soon left it off; and satisfied with a moderate competence left him by his parents, he devoted himself to a studious retirement. Towards the close of the year 1781 (being sensible of his approaching dissolution), he disposed of the whole of his mathematical library to a bookseller at York; and on May 20th 1782, he died of a lingering and painful disorder at his native village, aged near 81 years.

Mr Emerfon in his person was rather short, but strong and well-made, with an open countenance and ruddy complexion. He was exceedingly singular in his dress. He had but one coat, which he always wore open before, except the lower button; no waistcoat; his shirt quite the reverse of one in common use, no opening before, but buttoned close at the collar behind; a kind of flaxen wig which had not a crooked hair in it, and probably had never been tortured with a comb from the time of its being made. He always walked up to London when he had any thing to publish, reviving sheet by sheet himself:—Trusting no eyes but his own, was always a favourite maxim with him. He never advanced any mathematical proposition that he had not first tried in practice, constantly making all the different parts himself on a small scale, so that his house was filled with all kinds of mechanical instruments together or disjointed. He would frequently stand up to his middle in water while fishing, a diversion he was remarkably fond of. He used to study incessantly for some time, and then for relaxation take a ramble to any pot-house where he could get any body to drink with and talk to. The duke of Manchester was highly pleased with his company, and used often to come to him in the fields and accompany him home, but could never persuade him to get into a carriage. On these occasions he would sometimes exclaim, "Damn your whim-wham! I had rather walk." He was a married man; and his wife used to spin on an old-fashioned wheel, whereof a very accurate drawing is given in his mechanics. He was deeply skilled in the science of music, the theory of sounds, and the various scales both ancient and modern, but was a very poor performer.

The following is a list of Mr Emerfon's works.

1. The Doctrine of Fluxions.
2. The Projection of the Sphere, orthographic, stereographic, and gnomonical.
3. The Elements of Trigonometry.
4. The Principles of Mechanics.
5. A Treatise of Navigation on the Sea.
6. A Treatise of Algebra, in two books.
7. The Arithmetic of Infinites, and the differential Method, illustrated by Examples.
8. Mechanics; or the Doctrine of Motion.
9. The Elements of Optics, in four books.
10. A System of Astronomy.

11. The

Emerfon.

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11. The Laws of Centripetal and Centrifugal Force.
 12. The Mathematical Principles of Geography.
 13. Tracts, 8vo. 14. Cyclomatheſis; or an easy Introduction to the ſeveral Branches of the Mathematics. 15. A ſhort Comment on Sir Iſaac Newton's Principia; to which is added, A Defence of Sir Iſaac againſt the Objections that have been made to ſeveral Parts of his Works. 16. A Miſcellaneous Treatiſe, containing ſeveral Mathematical Subjects, 8vo. 1776.

EMERY, in natural hiſtory, a rich iron-ore found in large maſſes of no determinate ſhape or ſize, extremely hard, and very heavy. It is uſually of a duſky browniſh red on the ſurface; but when broken, is of a fine bright iron-grey, but not without ſome tinge of redneſs; and is ſpangled all over with ſhining ſpecks, which are ſmall flakes of a foliaceous talk, highly impregnated with iron. It is alſo ſometimes very red, and then uſually contains veins of gold. It makes no efferveſcence with any of the acid menſtrua; and is found in the iſland of Guernſey, in Tuſcany, and many parts of Germany.

Phil. Com.
 657.

Dr Lewis is of opinion, that ſome kinds of emery may contain the metal called *platina*, and on this ſubject has the following curious obſervations. ‘Alonſo Barba mentions a ſubſtance called *chumpi*; which is a hard fiſe of the emery kind, participating of iron, of a grey colour ſhining a little, very hard to work, becauſe it reſiſts the fire much, found in Potoſi, Chocaya, and other places, along with blackiſh and reddiſh ores that yield gold. If *platina* is really found in large maſſes, either generally or only now and then, one might reaſonably expect thoſe maſſes to be ſuch as are here deſcribed.

“Of the ſame kind perhaps alſo is the mineral mentioned by ſeveral authors under the name of Spaniſh emery, *ſmiris Hiſpanica*, which ſhould ſeem, from the accounts given of it, to be no other than *platina* or its matrix. The *ſmiris* is ſaid to be found in the gold mines, and its exportation prohibited; to contain films or veins of native gold; to be in great requeſt among the alchemiſts; to have been ſometimes uſed for the adulteration of gold; to ſtand, equally with the noble metal, cupellation, quartation, antimony, and the regal cement; and to be ſeparable from it by amalgamation with mercury, which throws out the *ſmiris* and retains the gold; properties ſtrongly characteristic of *platina*, and which do not belong to any known ſubſtance beſides. This debaſement of gold per *extractum ſmiridis Hiſpanici* is mentioned by Becher in his *Minera arenaria*, and ſeveral times hinted at in his *Phyſica ſubterranea*. Both Becher and Stahl indeed call the ſubſtance which the gold receives from the emery an earth, whereas *platina* is undoubtedly a metal; but this does not at all invalidate our ſuppoſition, for they give the name of earth alſo to the ſubſtance which copper receives from calamine in being made into braſs, which is now known to be metallic.

“From theſe obſervations I have been led to ſuſpect, that the European emeries likewiſe might poſſibly participate of *platina*. If this was certain, it would account ſatisfactorily for the uſe which ſome of the alchemiſts are ſaid to have made of emeries and other ferrugineous ores; and we ſhould no longer doubt, or wonder, that by treating gold with theſe kinds of minerals, they obtained a permanent augmen-

tation; that this augmentation, though it reſiſted lead, antimony, aquafortis, and the regal cement, was ſeparable, as Becher owns it was, by quickſilver; and that, when it exceeded certain limits, it rendered the gold pale and brittle.

“If emery contains *platina*, I imagined it might be diſcoverable by boiling the powdered mineral in melted lead, and afterwards working off the lead upon a teſt or cupel. The experiment was made with eight ounces of the fineſt powder of common emery, and the ſame quantity of lead; which were covered with black flux to prevent the ſcorification of the lead, and urged with a ſtrong fire for two or three hours. The lead became hard, rigid, of a dark colour, and a granulated texture, as if it had really imbibed ſome *platina* from the emery; but in cupellation it worked almoſt entirely off, leaving only a bead about the ſize of a ſmall pin's head, which was probably no other than ſilver contained in the lead.

“I repeated the experiment with ſome variation, thinking to obtain a more perfect reſolution of the emery by vitrifying it with the lead. Two ounces of fine emery and fix ounces of minium were well mixed together, and urged with a ſtrong fire, in a cloſe crucible, for an hour: they melted into an uniform dark browniſh glaſs. The glaſs was powdered, mixed with four ounces of fixt alkaline ſalt and ſome powdered charcoal, and put into a freſh crucible, with ſome common ſalt on the ſurface: The fire was pretty ſtrongly excited; but the fuſion was not ſo perfect as could be wiſhed, and only about two ounces of lead were found reſolved. This lead had ſuffered nearly the ſame change as that in the foregoing experiment; and, like it, gave no appearance of *platina* on being cupelled.

“It ſeems to follow from theſe experiments, that the emery employed in them contained no *platina*; but as it is not to be ſuppoſed that all emeries are of one compoſition, other ſorts may deſerve to be ſubmitted to the ſame trials. As gold is contained in ſome parcels of common minerals, and by no means in all the individuals of any one ſpecies; *platina* may poſſibly in like manner be found in ſome European ores, though there is not the leaſt footſtep of it in other parcels of the ſame kind of ore.”

EMETICS, medicines that induce vomiting.

EMIMS, ancient inhabitants of the land of Canaan beyond Jordan, who were defeated by Chedorlaomer and his allies, Gen. xiv. 5. Moſes tells us, that they were beaten in Shaveh Kirjathaim, which was in the country of Sihon conquered from the Moabites, Joſh. xiii. 19—21. The Emims were a warlike people, of a gigantic ſtature, great and many, and tall as the Anakims.

EMINENCE, in geography, a little hillock or aſcent above the level of the adjoining champaign.

EMINENCE is alſo a title of honour given to cardinals. The decree of the pope, whereby it was appointed that the cardinals ſhould be addreſſed under the quality of *eminence*, bears date the 10th of January 1630. They then laid aſide the titles of *illuſtriſſimi*, and *reverendiſſimi*, which they had borne before.

The grand maſter of Malta is likewiſe addreſſed under the quality of *eminence*. The popes John VIII. and Gregory VII. gave the ſame title to the kings of France. The emperors have likewiſe borne it.

Emery

Em-nence.

Emir
||
Emmius.

Eminentissimus, the superlative of *eminent*, has of late been attributed to the cardinals.

EMIR, a title of dignity among the Turks, signifying a prince.

This title was first given to the caliphs; but when they assumed the title of Sultans, that of emir remained to their children; as that of Cæsar among the Romans. At length the title came to be attributed to all who were judged to defend from Mahomet by his daughter Fatimah, and who wear the green turban instead of the white. The Turks make an observation, that the emirs, before their fortieth year, are men of the greatest gravity, learning, and wisdom; but after this, if they are not great fools, they discover some signs of levity and stupidity. This is interpreted by the Turks as a sort of divine impulse in token of their birth and sanctity. The Turks also call the vizirs, bashaws, or governors of provinces, by this name.

EMISSARY, in a political sense, a person employed by another to sound the opinions of people, spread certain reports, or act as a spy over other people's actions.

EMISSARY-Vessels, in anatomy, the same with those more commonly called EXCRETORY.

EMISSION, in medicine, a term used chiefly to denote the ejaculation of the semen or feed in the act of coition. See COITION, and GENERATION.

EMMANUEL, or IMMANUEL, a Hebrew word which signifies, 'God with us.' Isaiah (viii. 14.), in that celebrated prophecy, wherein he declares to Ahaz the birth of the Messiah, who was to be born of a virgin, says, This child shall be called, and really be, Emmanuel, that is, *God with us*. The same prophet (viii. 8.) repeats the same thing, while he is speaking of the enemy's army, which, like a torrent, was to overflow Judea. 'The fretching out of his wings shall fill the breadth of thy land, O Emmanuel.' The evangelist Matthew (i. 23.) infers us, that this prophecy was accomplished in the birth of Christ, born of the virgin Mary, in whom the two natures divine and human were united, and so in this sense he was really Emmanuel, or 'God with us.'

EMMERICK, a rich fortified town of Germany, in the circle of Westphalia, and duchy of Cleves. It carries on a good trade with the Dutch, and both Protestants and Catholics have the free exercise of their religion. The streets are neat and regular, and the houses tolerably built. It was taken by the French in 1672, and delivered to the elector of Brandenburg in 1673, under whose jurisdiction it now is. It is seated near the Rhine. E. Long. 5. 29. N. Lat. 52. 5.

EMMIUS (Ubbo), born at Gretha in East Friesland in 1547, was a very learned professor, and chosen rector of the college of Norden in 1579. This seminary flourished exceedingly under his care; and declined as visibly after he was ejected, in 1587, for refusing to subscribe the Confession of Augsburg. The year after, he was made rector of the college of Leer; and when the city of Groningen confederated with the United Provinces, the magistrates appointed him rector of that college: which employment he filled with the highest repute near 20 years; until, the college being erected into an university, he was the first rector, and one of the chief ornaments of it by his lectures, till his infirmities prevented his public appearance. His

wisdom was equal to his learning; so that the governor of Friesland and Groningen often consulted him, and seldom failed to follow his advice. He wrote *Vetus Græcia illustrata*, 3 vols; *Decades Rerum Friesicarum*; and many other valuable works. He died in 1625.

EMMENAGOGUES, *Εμμεναγωγος*, in medicine, such remedies as promote the menstrual discharge. They are thus called from *εμ*, "in," *μην*, "month," *αγω δω*, "I lead," because their natural periods of flowing are once a month.

EMOLLIENTS, in medicine and pharmacy, are such remedies as sheath and soften the asperity of the humours, and relax and supple the solids at the same time.

EMOLUMENT, is properly applied to the profits arising daily from an office or employ. The word is formed of the Latin *emolumentum*, which according to some, primarily signifies the profits redounding to the miller from his mill; of *mola*, *molare*, "to grind."—The patent, or other instrument, whereby a person is preferred to an office, gives him a right to enjoy all the dues, honours, profits, and emoluments belonging thereto.—*Emolument* is also used, in a somewhat greater latitude, for profit or advantage in the general.

EMOTION and PASSION, in the human mind, are thus distinguished by a celebrated writer*. An internal motion or agitation of the mind, when it passeth away without desire, is denominated an *emotion*; when desire follows, the motion or agitation is denominated a *passion*. A fine face, for example, raiseth in me a pleasant feeling: if that feeling vanish without producing any effect, it is in proper language an *emotion*; but if the feeling, by reiterated views of the object, becomes sufficiently strong to occasion desire, it loses its name of emotion, and acquires that of *passion*. The same holds in all the other passions. The painful feeling raised in a spectator by a slight injury done to a stranger, being accompanied with no desire of revenge, is termed an emotion; but that injury raiseth in the stranger a stronger emotion, which being accompanied with desire of revenge, is a passion. External expressions of distress produce in the spectator a painful feeling, which being sometimes so slight as to pass away without any effect, is an emotion; but if the feeling be so strong as to prompt desire of affording relief, it is a passion, and is termed *pity*. Envy is emulation in excess: if the exaltation of a competitor be barely disagreeable, the painful feeling is an emotion; if it produce desire to depress him, it is a passion. See PASSION.

EMOUY, or HIA-MEN, an island and port of China, under the jurisdiction of the province of FO-KIEN.

The port is properly but an anchoring-place for ships, inclosed on one side by the island from which it takes its name, and on the other by the main-land: but it is so extensive, that it can contain several thousands of vessels; and the depth of its water is so great, that the largest ships may lie close to the shore without danger.

In the beginning of the present century it was much frequented by European vessels; but few visit it at present, as all the trade is carried on at Canton. The emperor keeps here a garrison of 6 or 7000 men, commanded by a Chinese general. In entering this road,

Emmenag-
ogues
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Emouy.

*Elem of
Criticism,
vol. i. p. 41.

Emouy.

road, a large rock must be doubled which stands at the mouth of it, and divides it almost as the Mingaut divides the harbour of Brest. This rock is visible, and rises several feet above the surface of the water.

The island of Emouy is particularly celebrated on account of the magnificence of its principal pagod, consecrated to the deity Fo. This temple is situated in a plain, terminated on one side by the sea, and on the other by a lofty mountain. Before it the sea, flowing through different channels, forms a large sheet of water which is bordered with turf of the most beautiful verdure. The front of this edifice is 180 feet in length, and its gate is adorned with figures in relief, which are the usual ornaments of the Chinese architecture. On entering, you find a vault portico, with an altar in the middle, on which is placed a gigantic statue of gilt brass, representing the god Fo, sitting cross-legged. Four other statues are placed at the corners of this portico, which are 18 feet high, although they represent people sitting. Each of these statues is formed from a single block of stone. They bear in their hands different symbols which mark their attributes, as formerly in Athens and Rome the trident and caduceus distinguished Neptune and Mercury. One holds a serpent in its arms, which is twisted round its body in several folds; the second has a bent bow and a quiver; the two others present, one a kind of battle-axe, and the other a guitar, or some instrument of the same kind.

After crossing this portico, you enter a square outer court, paved with large gray stones, the least of which is ten feet in length and four in breadth. At the four sides of this court arise four pavilions, which terminate in domes, and have a communication with one another by means of a gallery which runs quite round it. One of these contains a bell ten feet in diameter; the wooden-work which supports this heavy mass cannot be sufficiently admired. In the other is kept a drum of an enormous size, which the bonzes use to proclaim the days of new and full moon. It must be observed, that the clappers of the Chinese bells are on the outside, and made of wood in the form of a mallet. The two other pavilions contain the ornaments of the temple, and often serve to lodge travellers, whom the bonzes are obliged to receive. In the middle of this court is a large tower, which stands by itself, and terminates also in a dome, to which you ascend by a beautiful stone stair-case that winds round it. This dome contains a temple remarkably neat; the ceiling is ornamented with mosaic work, and the walls are covered with stone figures in relief, representing animals and monsters. The pillars which support the roof of this edifice are of wood varnished; and on festivals are ornamented with small flags of different colours. The pavement of the temple is formed of little shells, and its different compartments represent birds, butterflies, flowers, &c.

The bonzes continually burn incense upon the altar, and keep the lamps lighted, which hang from the ceiling of the temple. At one extremity of the altar stands a brazen urn, which when struck sends forth a mournful sound: on the opposite side is a hollow machine of wood, of an oval form, used for the same purpose, which is to accompany with its sound their voices when they sing in praise of the tutelary idol of the pagod.

The god Ponfa is placed on the middle of this altar, on a flower of gilt brass, which serves as a base, and holds a young child in his arms; several idols, which are no doubt subaltern deities, are ranged around him, and show by their attitudes their respect and veneration.

The bonzes have traced out on the walls of this temple several hieroglyphical characters in praise of Pouffa; there is also to be seen an historical or allegorical painting in fresco, which represents a burning lake, in which several men appear to be swimming, some carried by monsters, others surrounded by dragons and winged serpents. In the middle of the gulph rises a steep rock, on the top of which the god is seated, holding in his arms a child, who seems to call out to those who are in the flames of the lake; but an old man, with hanging ears and horns on his head, prevents them from climbing to the summit of the rock, and threatens to drive them back with a large club. The bonzes are at a loss what answer to give, when any questions are asked them concerning this painting. Behind the altar is a kind of library, containing books which treat of the worship of idols.

On descending from this dome you cross the court, and enter a kind of gallery, the walls of which are lined with boards; it contains 24 statues of gilt brass, representing the same number of philosophers, ancient disciples of Confucius. At the end of this gallery you find a large hall, which is the refectory of the bonzes; and after having traversed a spacious apartment, you at length enter the temple of Fo, to which there is an ascent by a large stone stair-case. It is ornamented with vases full of artificial flowers (a work in which the Chinese excel); and here also are found the same kind of musical instruments as those mentioned before. The statue of the god is not to be seen but through a piece of black gauze, which forms a kind of veil or curtain before the altar. The rest of the pagod consists of several large chambers, exceedingly neat, but badly disposed; the gardens and pleasure grounds are on the declivity of the mountain; and a number of delightful grottos are cut out in the rock, which afford an agreeable shelter from the excessive heat of the sun.

There are several other pagods in the isle of Emouy; among which is one called *The Pagod of the Ten Thousand Stones*, because it is built on the brow of a mountain where there is a like number of little rocks, under which the bonzes have formed grottos and very pleasant covered seats. A certain rural simplicity reigns here, which captivates and delights.

Strangers are received by these bonzes with great politeness, and may freely enter their temples; but they must not attempt to gratify their curiosity fully, nor to enter those apartments into which they are not introduced, especially if they are accompanied by suspicious persons; for the bonzes, who are forbid under pain of severe punishment to have any intercourse with women, and who often keep them in private, might, from fear of being discovered, revenge themselves for too impertinent a curiosity.

EMPALEMENT, an ancient kind of punishment, which consisted in thrusting a stake up the fundament. The word comes from the French *empaler*, or the Italian *impalare*; or rather, they are all alike derived

Emouy,
Empale-
ment.

Empanel-ling
Emper. from the Latin *palus* "a stake," and the preposition *in*, "in or into." We find mention of empaling in Juvenal. It was frequently practised in the time of Nero, and continues to be so in Turkey.

EMPALEMENT of a Flower, the same with **CALYX**.

EMPANELLING. See **IMPANELLING**.

EMPARANCE. See **IMPARANCE**.

EMPEDOCLES, a celebrated philosopher and poet, was born at Agrigentum, a city in Sicily. He followed the Pythagorean philosophy, and admitted the metempsychosis. He constantly appeared with a crown of gold on his head; to maintain, by this outward pomp, the reputation he had acquired of being a very extraordinary man. Yet Aristotle says, that he was a great lover of liberty, extremely averse to state and command, and that he even refused a kingdom that was offered him. His principal work was a Treatise in verse on the Nature and Principles of Things. Aristotle, Lucretius, and all the ancients, make the most magnificent elogiums on his poetry and eloquence.

He taught rhetoric; and often alleviated the anxieties of his mind, as well as the pains of his body, with music. It is reported, that his curiosity to visit the flames of the crater of *Ætna* proved fatal to him. Some maintain that he wished it to be believed that he was a god; and that his death might be unknown, he threw himself into the crater and perished in the flames. His expectations, however, were frustrated; and the volcano by throwing up one of his sandals discovered to the world that Empedocles had perished by fire. Others report that he lived to an extreme old age; and that he was drowned in the sea about 440 years before the Christian era.

EMPEROR (*imperator*), among the ancient Romans, signified a general of an army, who, for some extraordinary success, had been complimented with this appellation. Thus Augustus, having obtained no less than twenty famous victories, was as often saluted with the title *emperor*; and Titus was denominated *emperor* by his army after the reduction of Jerusalem.

Afterwards, it came to denominate an absolute monarch or supreme commander of an empire. In this sense Julius Cæsar was called *emperor*: the same title descended with the dignity to Octavius, Augustus, Tiberius, and Caligula; and afterwards it became elective.

In strictness, the title *emperor* does not, and cannot, add any thing to the rights of sovereignty: its effect is only to give precedence and pre-eminence above other sovereigns; and as such, it raises those invested with it to the summit of all human greatness.

It is disputed, whether or not emperors have the power of disposing of the regal title. It is true, they have sometimes taken upon them to erect kingdoms; and thus it is that Bohemia and Poland are said to have been raised to the dignity: thus also, the emperor Charles the Bald, in the year 877, gave Provence to Boson, putting the diadem on his head, and decreeing it to be called "king," *ut more pristorum imperatorum regibus videretur dominari*. Add, that the emperor Leopold erected the ducal Prussia into a kingdom in favour of the elector of Brandenburg; and though several of the kings of Europe refused for some time to acknowledge him in that capacity, yet by the treaty of Utrecht in 1712 they all came in.

In the East, the title and quality of emperor are more frequent than they are among us; thus, the sovereign princes of China, Japan, Mogul, Persia, &c. are all emperors of China, Japan, &c. In the year 1723, the czar of Muscovy assumed the title of *emperor of all Russia*, and procured himself to be recognized as such by most of the princes and states of Europe.

In the West, the title has been a long time restrained to the emperors of Germany. The first who bore it was Charlemagne, who had the title of emperor conferred on him by Pope Leo III. though he had all the power before. The imperial prerogatives were formerly much more extensive than they are at present. At the close of the Saxon race, A. D. 1024, they exercised the right of conferring all the ecclesiastical benefices in Germany; of receiving the revenues of them during a vacancy; of succeeding to the effects of intestate ecclesiastics; of confirming or annulling the elections of the popes; of assembling councils, and of appointing them to decide concerning the affairs of the church; of conferring the title of king on their vassals; of granting vacant fiefs; of receiving the revenues of the empire; of governing Italy as its proper sovereigns; of erecting free cities, and establishing fairs in them; of assembling the diets of the empire, and fixing the time of their duration; of coining money, and conferring the same privilege on the states of the empire; and of administering both high and low justice within the territories of the different states: but in the year 1437, they were reduced to the right of conferring all dignities and titles, except the privilege of being a state of the empire; of *preces primarias*, or of appointing once during their reign a dignitary in each chapter or religious house; of granting dispensations with respect to the age of majority; of erecting cities, and conferring the privilege of coining money; of calling the meetings of the diet, and presiding in them.

To which some have added, 1. That all the princes and states of Germany are obliged to do them homage, and swear fidelity to them. 2. That they, or their generals, have a right to command the forces of all the princes of the empire, when united together. 3. That they receive a kind of tribute from all the princes and states of the empire, for carrying on a war which concerns the whole empire, which is called the *Roman month*. For the rest, there is not a foot of land or territory annexed to his title: but ever since the reign of Charles IV. the emperors have depended entirely on their hereditary dominions as the only source of their power, and even of their subsistence. See **DIET** and **ELECTORS**.

The kings of France were anciently also called emperors, at the time when they reigned with their sons, whom they associated to the crown. Thus Hugh Capet, having associated his son Robert, took the title of emperor, and Robert that of king; under which titles they are mentioned in the History of the Council of Rheims, by Gerbert, &c. King Robert is also called emperor of the French by Helgau of Fleury. Louis le Gros, upon associating his son, did the same. In the First Register of the King's Charters, fol. 166, are found letters of Louis le Gros, dated in 1116, in favour of Raymond bishop of Maguelonne, wherein he styles himself, *Ludovicus, Dei ordinante providentia*, *Frans.*

Emperor.

Empetrum
||
Empire

Francorum imperator augustus. The kings of England had likewise anciently the title of emperors, as appears from a charter of king Edgar: *Ego Edgarus Anglorum basileus, omniumque regum insularum oceani quæ Britanniam circumjacent, &c. imperator & dominus.*

EMPETRUM, BERRY-BEARING HEATH: A genus of the triandria order, belonging to the monœcia class of plants. In the natural method this genus is ranked by Linnæus under the 54th order, *Miscellaneæ*; and likewise among those of which the order is doubtful. The male calyx is tripartite; the corolla tripetalous; the stamina long; the female calyx is tripartite; the corolla tripetalous; the styles nine; the berry nine-seeded. There are two species; one of which, viz. the nigrum, which bears the crow-crake berries, is a native of Britain. It grows wild on boggy heaths and mountains. Children sometimes eat the berries; but, when taken in too great quantity, they are apt to occasion a headach. Grouse feed upon them. When boiled with alum, they afford a dark purple dye. Goats are not fond of it. Cows, sheep, and horses refuse it.

EMPHASIS, in rhetoric, a particular stress of the voice and action, laid on such parts or words of the oration as the orator wants to enforce upon his audience. See **DECLAMATION**; **ORATORY**, Part IV.; and **READING**.

EMPHYSEMA, in surgery, a windy tumor, generally occasioned by a fracture of the ribs, and formed by the air insinuating itself, by a small wound, between the skin and muscles, into the substance of the cellular or adipose membrane, spreading itself afterwards up to the neck, head, belly, and other parts, much after the manner in which butchers blow up their veal.

EMPIRE (*imperium*), in political geography, a large extent of land, under the jurisdiction or government of an emperor. See **EMPEROR**.

In ancient history we read of four great monarchies or empires, viz. that of the Babylonians, Chaldeans, and Assyrians; that of the Medes and Persians; that of the Greeks; and that of the Romans. The first subsisted from the time of Nimrod, who founded it in the year of the world 1800, according to the computation of Usher, to Sardanapalus their last king in 3257, and consequently lasted above 1450 years. The empire of the Medes commenced under Arbace, in the year of the world 3257, and was united to that of the Babylonians and Persians under Cyrus, in the 3468, and it closed with the death of Darius Codomannus in 3674. The Grecian empire lasted only during the reign of Alexander the Great, beginning in the year of the world 3674, and terminating with the death of this conqueror in 3681, his conquests being divided among his captains. The Roman empire commenced with Julius Cæsar, when he was made perpetual dictator, in the year of the city 708, and of the world 3956, 48 years after Christ. The seat of the empire was removed to Byzantium by Constantine, in the year of our Lord 334; the east and west were then united under the title of the Roman empire, till the Romans proclaimed Charlemagne emperor, A. D. 800. From this epocha the east and west formed two separate empires; that of the east, governed by Greek emperors, commenced A. D. 802; and being gradually weakened, terminated under

Constantine Palæologus in 1453. The western empire was afterwards known by the appellation of the empire or German empire.

Antiquaries distinguish between the medals of the upper, and lower or bas, empire.—The curious only value those of the upper empire, which commences with Cæsar or Augustus, and ends in the year of Christ 260. The lower empire comprehends near 1200 years, reckoning down to the destruction of Constantinople in 1453.—They usually distinguish two ages, or periods, of the lower empire: the first beginning where the upper ends, viz. with Aurelian, and ending with Anastasius, including 200 years; the second beginning with Anastasius, and ending with the Palæologi, which includes 1000 years.

EMPIRE, or The empire, used absolutely and without any addition, signifies the empire of Germany; called also, in juridical acts and laws, The holy Roman empire. It had its beginning with the ninth century; Charlemagne being created first emperor by Pope Leo III. who put the crown on his head in St Peter's church on Christmas-day in the year 800.

Authors are at a loss under what form of government to range the empire. Some of them maintain it to be a monarchical state, because all the members thereof are obliged to ask the investiture of their states of the emperor, and to take an oath of fidelity to him. Others consider it as a republic, or aristocratic state, because the emperor cannot resolve or determine any thing without the concurring suffrages of the princes. It is added, that if they require investiture from, and swear fealty to him, it is only as head of the republic, and in the name of the republic, and not in his own; just as at Venice every thing is transacted in name of the doge. Others will have the empire to be a monarcho-aristocratic state, i. e. a mixture of monarchy and aristocracy; because, though the emperor in many cases seems to act sovereignly, yet his decrees and resolves have no force, in case the state refuse to confirm them. Lastly, it has been called an aristo-democratic state, because the diet, wherein the sovereignty is lodged, is composed of princes and the deputies of the cities; and is divided into three orders or bodies, called *colleges*, viz. the college of electors, the college of princes, and the college of cities.

We say, diet of the empire, circles of the empire, fiefs of the empire, princes of the empire, estates of the empire, members of the empire, capitulations of the empire. See **DIET**, **CIRCLE**, **PRINCE**, **CAPITULATION**, &c.

The states or estates of the empire are of two kinds, mediate and immediate. The immediate states are those who hold immediately of the empire: Whereof, again, there are two kinds; the first, such as have seats and voices in the imperial diet; the second, such as have none. The mediate states are those who hold of the immediate.

The states which now compose the empire are, The princes of the empire, the counts of the empire, the free barons of the empire, the prelates of the empire, the princeesses or abbesses of the empire, the nobles of the empire, and the imperial cities.

EMPIRIC, an appellation given to those physicians who conduct themselves wholly by their own experience, without studying physic in a regular way.

Some

Empire,
Empirie

Empla
Emulgent.

Some even use the term, in a still worse sense, for a quack who prescribes at random, without being at all acquainted with the principles of the art.

EMPIS, in zoology, a genus of insects belonging to the order Diptera; of which the characters are these: The proboscis is of an horny substance, bivalve, reflexed under the head and breast, and longer than the thorax. See a specimen on Plate CLXXXII.

EMPLASTER. See PLASTER.

EMPORIÆ, a double city of the Hither Spain, near the Pyrenees; separated by a wall; one part occupied by the Greeks of Phocæa, whence originally are the Massilienses; the other, by native Spaniards, to whom was added by Augustus a Roman colony. Now Ampurias, in Catalonia. E. Long. 2. 50. N. Lat. 42.

15. EMPORIUM, in medicine, is often used for the common sensory in the brain. See BRAIN.

EMPORIUM, (anc. geog.), two cities near Placentia; one well fortified, and guarded by a strong garrison, at which Hannibal met a repulse: the other, Hannibal took and plundered. Now thought to be Ponte Nura, in the duchy of Placentia.

EMPRESS, the spouse of an emperor, or a woman who governs an empire. See EMPEROR.

EMPROSTHOTHONOS, a species of convulsion, wherein the head bends forward.

EMPYÆMA, in medicine, a disorder wherein purulent matter is contained in the thorax or breast, after an inflammation and suppuration of the lungs and pleura. See MEDICINE-INDEX.

EMPYREAL AIR. So Dr Higgins denominates that which Dr Priestley calls *dephlogificated air*, and other philosophers *vital* or *pure air*.

EMPYREUM, a term used by divines for the highest heaven, where the blessed enjoy the beatific vision. The word is formed of $\epsilon\upsilon$ and $\pi\upsilon\rho$ fire, because of its splendor.

EMPYREUMA, in chemistry, signifies a very disagreeable smell produced from burnt oils. It is often perceived in distillations of animal as well as vegetable substances when they are exposed to a quick fire.

EMRODS. See HEMORRHOIDS.

EMULATION, a generous ardor kindled by the praise-worthy examples of others, which impels us to imitate, to rival, and, if possible, to excel them. This passion involves in it esteem of the person whose attainments or conduct we emulate, of the qualities and actions in which we emulate him, and a desire of resemblance, together with a joy springing from the hope of success. The word comes originally from the Greek $\alpha\mu\upsilon\lambda\lambda\alpha$, *dispute, contest*; whence the Latin, *emulus*, and thence our *emulation*.

Plato observes of emulation, that it is the daughter of envy; if so, there is a great difference between the mother and the offspring; the one is a virtue and the other a vice. Emulation admires great actions, and strives to imitate them; envy refuses them the praises that are their due; emulation is generous, and only thinks of surpassing a rival; envy is low, and only seeks to lessen him. Perhaps, therefore, it would be more just to suppose emulation the daughter of admiration: admiration, however, is a principal ingredient in the composition of it.

EMULGENT, or RENAL, ARTERIES; those which

supply the kidneys with blood; being sometimes single, sometimes double, on each side. See ANATOMY, n° 23.

EMULSION, a soft liquid remedy, of a colour and consistence resembling milk. See PHARMACY.

EMUNCTORY, in anatomy, a general term for all those parts which serve to carry off the excrementitious parts of the blood and other humours of the body. Such more especially are the kidneys, bladder, and most of the glands.

ENALLAGE, in grammar, is when one word is substituted for another of the same part of speech: A substantive for an adjective; as *exercitus victor*, for *victoriosus*; *scelus*, for *sceleratus*: A primitive for a derivative; as *Dardana arma*, for *Dardania*: An active for a passive; as *nox humida calo precipitatur*, for *precipitatur*, &c.

ENAMEL, in general, is a vitrified matter betwixt the parts of which is dispersed some unvitrified matter; hence enamel ought to have all the properties of glass except transparency.

Enamels have for their basis a pure crystal glass or frit, ground up with a fine calx of lead and tin prepared for the purpose, with the addition usually of white salt of tartar. These ingredients baked together are the matter of all enamels, which are made by adding colours of this or that kind in powder to this matter, and melting or incorporating them together in a furnace.

For white enamel, Neri (*De Arte Vitrari.*) directs only manganese to be added to the matter which constitutes the basis. For azure, zaffer mixed with calx of brasa. For green, calx of brasa with scales of iron, or with crocus martis. For black, zaffer with manganese or with crocus martis; or manganese with tartar. For red, manganese, or calx of copper and red tartar. For purple, manganese with calx of brasa. For yellow, tartar and manganese. And for violet-coloured enamel, manganese with thrice-calcined brasa.

In making these enamels, the following general cautions are necessary to be observed. 1. That the pots must be glazed with white glass, and must be such as will bear the fire. 2. That the matter of enamels must be very nicely mixed with the colours. 3. When the enamel is good, and the colour well incorporated, it must be taken from the fire with a pair of tongs. 4. The general way of making the coloured enamel is this: Powder, sift, and grind, all the colours very nicely, and first mix them with one another, and then with the common matter of enamels: then set them in pots in a furnace; and when they are well mixed and incorporated, cast them into water; and when dry, set them in a furnace again to melt; and when melted, take a proof of it. If too deep-coloured, add more of the common matter of enamels; and if too pale, add more of the colours.

Enamels are used either in counterfeiting or imitating precious stones, in painting in enamel; or by enamellers, jewellers, and goldsmiths, in gold, silver, and other metals. The two first kinds are usually prepared by the workmen themselves, who are employed in these arts. That used by jewellers, &c. is brought to us chiefly from Venice or Holland, in little cakes of different sizes, commonly about four inches diameter, having the mark of the maker stuck upon it with a puncheon. It pays 1 s. 7 $\frac{1}{2}$ d. the pound on importation,

Emulsion
Enamel.

Enamel-ling. tation, and draws back 1 s. 5^{re} 0^d. at the rate of 4 s. per pound.

ENAMELLING, the art of laying enamel upon metals, as gold, silver, copper, &c. and of melting it at the fire, or of making divers curious works in it at a lamp. It signifies also to paint in enamel.

The method of painting in ENAMEL. This is performed on plates of gold or silver, and most commonly of copper, enamelled with the white enamel; whereon they paint with colours which are melted in the fire, where they take a brightness and lustre like that of glass. This painting is the most prized of all for its peculiar brightness and vivacity, which is very permanent, the force of its colours not being effaced or sullied with time as in other painting, and continuing always as fresh as when it came out of the workmen's hands. It is usual in miniature; it being the more difficult the larger it is, by reason of certain accidents it is liable to in the operation. Enamelling should only be practised on plates of gold, the other metals being less pure: copper, for instance, scales with the application, and yields fumes; and silver turns the yellow white. Nor must the plate be made flat; for in such case, the enamel cracks; to avoid which, they usually forge them a little round or oval, and not too thick. The plate being well and evenly forged, they usually begin the operation by laying on a couch of white enamel (as we observed above) on both sides, which prevents the metal from swelling and blistering; and this first layer serves for the ground of all the other colours. The plate being thus prepared, they begin at first by drawing out exactly the subject to be painted with red vitriol, mixed with oil of spike, marking all parts of the design very lightly with a small pencil. After this, the colours (which are to be before ground with water in a mortar of agate extremely fine, and mixed with oil of spike somewhat thick) are to be laid on, observing the mixtures and colours that agree to the different parts of the subject; for which it is necessary to understand painting in miniature. But here the workman must be very cautious of the good or bad qualities of the oil of spike he employs to mix his colours with, for it is very subject to adulterations.

Great care must likewise be taken, that the least dust imaginable come not to your colours while you are either painting or grinding them; for the least speck, when it is worked up with it, and when the work comes to be put into the reverberatory to be red hot, will leave a hole, and so deface the work.

When the colours are all laid, the painting must be gently dried over a slow fire to evaporate the oil, and the colours afterwards melted to incorporate them with the enamel, making the plate red hot in a fire like what the enamellers use. Afterwards that part of the painting must be passed over again which the fire hath any thing effaced, strengthening the shades and colours, and committing it again to the fire, observing the same method as before, which is to be repeated till the work be finished.

Method of ENAMELLING by the Lamp. Most enamelled works are wrought at the fire of a lamp, in which, instead of oil, they put melted horse-grease, which they call *caballine oil*. The lamp, which is of copper, or white iron, consists of two pieces; in one of which is a kind of oval plate, six inches long, and two high,

in which they put the oil and the cotton. The other Enamelling part, called the *box*, in which the lamp is inclosed, serves only to receive the oil which boils over by the force of the fire. This lamp, or, where several artists work together, two or three more lamps are placed on a table of proper height. Under the table, about the middle of its height, is a double pair of organ-bellows, which one of the workmen moves up and down with his foot to quicken the flame of the lamps, which are by this means excited to an incredible degree of vehemence. Grooves made with a gauge in the upper part of the table, and covered with parchment, convey the wind of the bellows to a pipe of glass before each lamp; and that the enamellers may not be incommoded with the heat of the lamp, every pipe is covered at six inches distance with a little tin plate, fixed into the table by a wooden handle. When the works do not require a long blast, they only use a glass-pipe, into which they blow with their mouth.

It is incredible to what a degree of fineness and delicacy the threads of enamel may be drawn at the lamp. Those which are used in making false tufts of feathers are so fine, that they may be wound on the reel like silk or thread. The fictitious jets of all colours, used in embroideries, are also made of enamel; and that with so much art, that every small piece hath its hole to pass the thread through wherewith it is sewed. These holes are made by blowing them into long pieces; which they afterwards cut with a proper tool.

It is seldom that the Venetian or Dutch enamels are used alone: they commonly melt them in an iron-ladle, with an equal part of glass or crystal; and when the two matters are in perfect fusion, they draw it out into threads of different sizes, according to the nature of the work. They take it out of the ladle while liquid, with two pieces of broken tobacco-pipes, which they extend from each other at arm's length. If the thread is required still longer, then another workman holds one end, and continues to draw it out, while the first holds the enamel to the flame. Those threads, when cold, are cut into what lengths the workman thinks fit, but commonly from 10 to 12 inches; and as they are all round, if they are required to be flat, they must be drawn through a pair of pinchers while yet hot. They have also another iron instrument in form of pinchers, to draw out the enamel by the lamp when it is to be worked and disposed in figures. Lastly, they have glass-tubes of various sizes, serving to blow the enamel into various figures, and preserve the necessary vacancies therein; as also to spare the stuff, and form the contours. When the enameller is at work, he sits before the lamp with his foot on the step that moves on the bellows; and holding in his left hand the work to be enamelled, or the brass or iron-wires the figures are to be formed on, he directs with his right the enamel thread, which he holds to the flame with a management and patience equally surprising. There are few things they cannot make or represent with enamel; and some figures are as well finished, as if done by the most skillful carvers.

ENARTHROSIS, in anatomy, a species of DIARTHROSIS.

ENCÆNIA, the name of three several feasts celebrated by the Jews in memory of the dedication, or

Encænia.

Encaim-
ment
||
Encaustic.

rather purification, of the temple, by Judas Maccabæus, Solomon, and Zorobabel. This term is likewise used, in church-history for the dedication of Christian churches.

ENCAMPMENT, the pitching of a Camp.

ENCANTHIS, in surgery, a tubercle arising either from the caruncula lachrymalis, or from the adjacent red skin; sometimes so large, as to obstruct not only the puncta lachrymalia, but also part of the sight or pupil itself. See SURGERY.

ENCAUSTIC and ENCAUSTUM, the same with enamelling and enamel. See ENAMELLING and ENAMEL.

ENCAUSTIC Painting, a method of painting made use of by the ancients, in which wax was employed to give a gloss to their colours, and to preserve them from the injuries of the air.

This ancient art, after having been long lost, was restored by Count Caylus, a member of the Academy of Inscriptions in France; and the method of painting in wax was announced to the Academy of Painting and Belles Lettres in the year 1753; though M. Bachelier, the author of a treatise *De l'Histoire & du Secret de la Peinture en Cire*, had actually painted a picture in wax in 1749; and he was the first who communicated to the public the method of performing the operation of infusion, which is the principal characteristic of the encaustic painting. The Count kept his method a secret for some time, contenting himself with exhibiting a picture at the Louvre in 1754, representing the head of Minerva, painted in the manner of the ancients, which excited the curiosity of the public, and was very much admired. In the interval of suspense, several attempts were made to recover the ancient method of painting. The first scheme adopted was that of melting wax and oil of turpentine together, and using this composition as a vehicle for mixing and laying on the colours. But this method did not explain Pliny's meaning, as the wax is not burnt in this way of managing it. In another attempt, which was much more agreeable to the historian's description of encaustic painting, the wax was melted with strong lixivium of salt of tartar, and with this the colours were ground. When the picture was finished, it was gradually presented to the fire, so as to melt the wax; which was thus diffused through all the particles of the colours, so that they were fixed to the ground, and secured from the access of air or moisture. But the method of count Caylus is much more simple: the cloth or wood, which he designed for the basis of his picture, is waxed over, by only rubbing it simply with a piece of bees-wax; the wood or cloth, stretched on a frame, being held horizontally over, or perpendicularly before a fire, at such a distance, that the wax might gradually melt, whilst it is rubbed on, diffuse itself, penetrate the body, and fill the interstices of the texture of the cloth, which, when cool, is fit to paint upon; but as water-colours, or those that are mixed up with common water, will not adhere to the wax, the whole picture is to be first rubbed over with Spanish chalk or white, and then the colours are applied to it; when the picture is dry, it is put near the fire, whereby the wax melts, and absorbs all the colours.

Mr J. H. Muntz, in a treatise on this subject, has
Nº 115.

proposed several improvements in the art of encaustic painting. When the painting is on cloth, he directs it to be prepared by stretching it on a frame, and rubbing one side several times over with a piece of bees-wax, or virgin wax, till it is covered with a coat of wax of considerable thickness. In fine linen, this is the only operation necessary previous to painting; but coarse cloth must be rubbed gently on the unwaxed side with a pumice stone, to take of all those knots which would prevent the free and accurate working of the pencil. Then the subject is to be painted on the unwaxed side with colours prepared and tempered with water; and when the picture is finished, it must be brought near the fire, that the wax may melt and fix the colours. This method, however, can only be applied to cloth or paper, through the substance of which the wax may pass; but in wood, stone, metals, or plaster, the former method of Count Caylus must be observed.

Mr Muntz has also discovered a method of forming grounds for painting with crayons, and fixing these, as well as water-colours, employed with the pencil. On the unwaxed side of a linen cloth, stretched and waxed as before, lay an even and thick coat of the colour proper for the ground; having prepared this colour by mixing some proper pigment with an equal quantity of chalk, and tempering them with water. When the colour is dry, bring the picture to the fire that the wax may melt, pass through the cloth, and fix the ground. An additional quantity of wax may be applied to the back of the picture, if that which was first rubbed on should not be sufficient for the body of colour; but as this must be laid on without heat, the wax should be dissolved in oil of turpentine, and applied with a brush, and the canvas be again exposed to the fire, that the fresh supply of wax may pass through the cloth, and be absorbed by the colour; and thus a firm and good body will be formed for working on with the crayons. If cloth and paper are joined together, the cloth must be first fixed to the straining frame, and then the paper must be pasted to it with a composition of paste made with wheaten flour, or starch and water, and about a twelfth part of its weight of common turpentine. The turpentine must be added to the paste when it is almost sufficiently boiled, and the composition well stirred, and left to simmer over the fire for five or six minutes; let wax be dissolved in oil of turpentine to the consistence of a thin paste; and when the cloth and paper are dry, let them be held near a fire; and with a brush lay a coat of the wax and turpentine on both sides the joined cloth and paper, in such a degree of thickness, that both surfaces may shine throughout without any appearance of dull spots. Then expose the cloth to the fire or to the sun; by which means the oil will evaporate, and the wax become solid, and be fit to receive any composition of colour for a ground, which is to be laid on as above directed in the case of cloth without paper.

Almost all the colours that are used in oil-painting may be also applied in the encaustic method. Mr Muntz objects, indeed, to brown, light pink, and unburnt terra di Sienna; because these, on account of their gummy or stony texture, will not admit such a cohesion with the wax as will properly fix them; but

other colours which cannot be admitted in oil-painting, as red lead, red-orpiment, crytalls of verdegris, and red precipitate of mercury, may be used here. The crayons used in encaustic painting are the same with those used in the common way of crayon painting, excepting those that in their composition are too tenacious; and the method of using them is the same in both cases.

The encaustic painting has many peculiar advantages: though the colours have not the natural varnish or shining which they acquire with oil, they have all the strength of paintings in oil, and all the airiness of water-colours, without partaking of the apparent character or defects of either; they may be looked at in any light and in any situation, without any false glare: the colours are firm, and will bear washing; and a picture, after having been smoked, and then exposed to the dew, becomes as clean as if it had been but just painted. It may also be retouched at pleasure without any detriment to the colours; for the new colours will unite with the old ones, without spots, as is the case in common size painting; nor is it necessary to rub the places to be retouched with oil as in oil pictures; it is not liable to crack, and easily repaired, if it should chance to suffer any injury. The duration of this painting is also a very material advantage; the colours are not liable to fade and change; no damp can affect them, nor any corrosive substance injure them; nor can the colour fall off in shivers from the canvas. However, notwithstanding all these and other advantages enumerated by the abbe Mazzeas and Mr. Muntz, this art has not yet been much practised. Many of these properties belong to a much higher species of encaustic painting afterwards discovered in England, the colours of which are fixed by a very intense heat; nor are the colours or grounds on which they are laid liable to be dissolved or corroded by any chemical menstrum, nor, like the glassy colours of enamel, to run out of the drawing on the fire. What this method consists in will appear from the following account communicated in a letter from Mr. Josiah Colebrook to the earl of Macclesfield president of the Royal Society in 1759.

"The art of painting with burnt wax (says he) has long been lost to the world. The use of it to painters in the infancy of the art of painting, was of the utmost consequence. Drying oil being unknown, they had nothing to preserve their colours entire from the injury of damps and the heat of the sun: a varnish of some sort was therefore necessary; but they being unacquainted with distilled spirits, could not, as we now do, dissolve gums to make a transparent coat for their pictures: this invention therefore of burnt wax supplied that defect to them; and with this manner of painting, the chambers and other rooms in their houses were furnished: this Pliny calls *encaustum*, and we *encaustic painting*.

"The following experiments which I have the honour

to lay before your Lordship and the Society, were occasioned by the extract of a letter from the abbe Mazzeas, translated by Dr. Parfons, and published in the second part of the XLIXth volume of the Philosophical Transactions, n^o 100. concerning the ancient method of painting with burnt wax, revived by count Caylus.

"The count's method was, 1. To rub the cloth or board designed for the picture simply over with bees-wax. 2. To lay on the colours mixed with common water; but as the colours will not adhere to the wax, the whole picture was first rubbed over with (A) Spanish chalk, and then the colours are used. 3. When the picture is dry, it is put near the fire, whereby the wax melts, and absorbs all the colours.

"Exp. I. A piece of oak-board was rubbed over with bees-wax, first against the grain of the wood, and then with the grain, to fill up all the pores that remained after it had been planed, and afterwards was rubbed over with as much dry Spanish white as could be made to stick on it. This, on being painted (the colours mixed with water only), so clogged the pencil, and mixed so unequally with the ground, that it was impossible to make even an outline, but what was so much thicker in one part than another, that it would not bear so much as the name of painting; neither had it any appearance of a picture. However, to pursue the experiment, this was put at a distance from the fire, on the hearth, and the wax melted by slow degrees: but the Spanish white (though laid as smooth as so soft a body would admit, before the colour was laid on), on melting the wax into it, was not sufficient to hide the grain of the wood, nor show the colours by a proper whiteness of the ground; the wax, in rubbing on the board, was unavoidably thicker in some parts than in others, and the Spanish white the same: on this I suspected there must be some mistake in the Spanish white, and made the inquiry mentioned (in the note A).

"To obviate the inequality of the ground in the first experiment;

"Exp. 2. A piece of old wainscot (oak board) $\frac{1}{4}$ th of an inch thick; which, having been part of an old drawer, was not likely to shrink on being brought near the fire: this was smoothed with a silk-skin, made quite warm before the fire; and then, with a brush dipped in white wax, melted in an earthen pipkin, smeared all over, and applied to the fire again, that the wax might be equally thick on all parts of the board, a ground was laid (on the waxed board), with levigated chalk mixed with gum-water, (*viz.* gum Arabic dissolved in water): when it was dry, I painted it with a kind of landscape; and pursuing the method laid down by count Caylus, brought it gradually to the fire. I fixed the picture on a fire-screen, which would preserve the heat, and communicate it to the back part of the board. This was placed first at the distance of three feet from the fire, and brought forwards by slow degrees, till it came

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within

(A) "Spanish chalk is called by Dr. Parfons, in a note, *Spanish white*. This is a better kind of whitening than the common, and was the only white that had the name of *Spanish* annexed to it that I could procure, though I inquired for it at most if not all the colour-shops in town.

"My friend M. da Costa showed me a piece of Spanish chalk in his collection, which seemed more like a CIMOLIA (tobacco-pipe clay), and was the reason of my using that in one of the experiments.

Encaustic. within one foot of the fire, which made the wax swell and bloat up the picture; but as the chalk did not absorb the wax, the picture fell from the board and left it quite bare.

"Exp. 3. I mixed three parts white wax, and one part white refin, hoping the tenacity of the refin might preserve the picture. This was laid on a board heated with a brush, as in the former; and the ground was chalk, prepared as before. This was placed horizontally on an iron box, charged with an hot heater, shifting it from time to time, that the wax and refin might penetrate the chalk; and hoping from this position, that the ground, bloated by melting the wax, would subside into its proper place; but this, like the other, came from the board, and would not at all adhere.

"Exp. 4. Prepared chalk four drams, white wax, white refin, of each a dram, burnt alabaster half a dram, were all powdered together and sifted, mixed with spirit of molasses instead of water, and put for a ground on a board smeared with wax and refin, as in Exp. 3. This was also placed horizontally on a box-iron as the former: the picture blistered, and was cracked all over; and though removed from the box-iron to an oven moderately heated (in the same horizontal position), it would not subside, nor become smooth. When it was cold, I took an iron spatula made warm, and moved it gently over the surface of the picture, as if I were to spread a plaster. (This thought occurred, from the board being prepared with wax and refin, and the ground having the same materials in its composition, the force of the spatula might make them unite). This succeeded so well, as to reduce the surface to a tolerable degree of smoothness; but as the ground was broke off in many places, I repaired it with flake white, mixed up with the yolk of an egg and milk, and repainted it with molasses spirit (instead of water), and then put it into an oven with a moderate degree of heat. In this I found the colours fixed, but darker than when it was at first painted: and it would bear being washed with water, not rubbed with a wet cloth.

"Exp. 5. A board (that had been used in a former experiment) was smeared with wax and refin, of each equal parts; was wetted with molasses spirit, to make whitening (or Spanish white) mixed with gum-water adhere. This, when dry, was scraped with a knife, to make it equally thick in all places. It was put into a warm oven, to make the varnish incorporate partly with the whitening before it was painted; and it had only a small degree of heat: water only was used to mix the colours. This was again put into an oven with a greater degree of heat; but it flaked off from the board: whether it might be owing to the board's having had a second coat of varnish (the first having been scraped and melted off), and that the unctuous parts of the wax had entered its pores, that it would not retain a second varnish, I cannot tell.

"Exp. 6. Having miscarried in these trials, I took a new board, planed smooth, but not polished either with a fish-skin or rushes: I warmed it, and smeared it with wax only; then took *cinolia* (tobacco-pipe clay) divested of its sand, by being dissolved in water and

Encaustic. poured off, leaving the coarse heavy parts behind. After this was dried and powdered, I mixed it with a small quantity of the yolk of an egg and cow's milk, and made a ground with this on the waxed board: this I was induced to try, by knowing that the yolk of an egg will dissolve almost all unctuous substances, and make them incorporate with water; and I apprehended, that a ground, thus prepared, would adhere so much the more firmly to the board than the former had done, as to prevent its flaking off. The milk, I thought, might answer two purposes; first, by uniting the ground with the wax; and secondly, by answering the end of size or gum-water, and prevent the colours from sinking too deep into the ground, or running one into another. When the ground was near dry, I smoothed it with a pallet knife, and washed with milk and egg where I had occasion to make it smooth and even: when dry I painted it, mixing the colours with common water; this, on being placed horizontally in an oven only warm enough to melt the wax, flaked from the board; but held so much better together than any of the former, that I passed part of it on paper.

"Exp. 7. Flake-white (or the purest sort of white-lead) mixed with egg and milk, crumbled to pieces in the oven, put on the waxed board, as in the last experiment.

"The bad success which had attended all the former experiments, led me to consider of what use the wax was in this kind of painting: and it occurred to me, that it was only as a varnish to preserve the colours from fading.

"In order to try this:

"Exp. 8. I took what the brick-layers call *fine fluff*, or *putty* (B): to this I added a small quantity of burnt alabaster, to make it dry: this it soon did in the open air; but before I put on any colours, I dried it gently by the fire, lest the colours should run. When it was painted, I warmed it gradually by the fire (to prevent the ground from cracking) till it was very hot. I then took white wax three parts, white refin one part, melted them in an earthen pipkin, and with a brush spread them all over the painted board, and kept it close to the fire in a perpendicular situation, that what wax and refin the plaster would not absorb might drop off. When it was cold, I found the colours were not altered, either from the heat of the fire, or passing the brush over them. I then rubbed it with a soft linen cloth, and thereby procured a kind of gloss, which I afterwards increased by rubbing it with an hard brush; which was so far from scratching or leaving any marks on the picture, that it became more smooth and polished by it.

"After I had made all the foregoing experiments, in conversation with my honoured and learned friend Dr Kidby, a fellow of this society, I said I had been trying to find out what the encaustic painting of the ancients was. Upon which he told me, that there was a passage in Vitruvius *de Architectura*, relative to that kind of painting; and was so good as to transcribe it for me from the 7th book, chap. 9. *De minii temperatura*. Vitruvius's words are: *At si quis subtilior fuerit, & voluerit expolitionem miniacam suum colorem retinere,*

Encaustic. retinere, cum paries expolitus & aridus fuerit, tunc ceram Puniceam liquefactam igni, paulo oleo temperatam, seta inducat, deinde posita carbonibus in ferro vase compositis, eam ceram apprimere cum pariete, calefaciendo sudore cogat, fiatque ut persequatur, deinde cum candela lintesque parti subigat, ut signa marmorea nuda curantur. Hæc autem *xavris* Græce dicitur. Ita olivæ cere Punice loricæ non patitur, nec luna splendorem, nec solis radios lambendo eripere ex his positionibus colorem.

"Which I thus translate: 'But if any one in more wary, and would have the polishing [painting] with vermilion hold its colour, when the wall is painted and dry, let him take Carthaginian [Barbary] wax, melted with a little oil, and rub it on the wall with an hair-pencil; and afterwards let him put live coals into an iron vessel [chaffing-dish], and hold it close to the wax, when the wall, by being heated, begins to sweat; then let it be made smooth: afterwards let him rub it with a (c) candle and (d) clean linen rags, in the same manner as they do the naked marble statues. This the Greeks call *xavris*. The coat of Carthaginian wax (thus put on) is so strong, that it neither suffers the moon by night, nor the sun-beams by day, to destroy the colour.'

"Being fatished, from this passage in Vitruvius, that the manner of using wax in Exp. 8. was right, I was now to find if the wax-varnish, thus burnt into the picture, would bear washing. But here I was a little disappointed; for rubbing one corner with a wet linen cloth, some of the colour came off; but washing it with a soft hair-pencil dipped in water, and letting it dry without wiping, the colour stood very well.

"A board painted, as in Exp. 8. was hung in the most smoky part of a chimney for a day, and exposed to the open air in a very foggy night. In the morning the board was seemingly wet through, and the water ran off the picture. This was suffered to dry without wiping; and the picture had not suffered at all from the smoke or the dew, either in the ground or the colours; but when dry, by rubbing it, first with a soft cloth, and afterwards with a brush, it recovered its former gloss.

"Suspecting that some tallow might have been mixed with the white wax I had used, which might cause the colours to come off on being rubbed with a wet cloth, I took yellow wax which had been melted from the honeycomb in a private family, and consequently not at all adulterated: to three parts of this I added one part resin, and melted them together.

"Exp. 9. Spanish-white, mixed with fish-glue, was put for a ground on a board, and painted with water-colours only. The board was made warm; and then the wax and resin were put on with a brush, and kept close to the fire till the picture had imbibed all the varnish, and looked dry. When it was cold, I rub-

bed it first with a linen cloth, and then polished it with *Encaustic.* an hard brush.

"In these experiments I found great difficulties with regard to colours. Many water-colours being made from the juices of plants, have some degree of an acid in them; and these, when painted on an alkaline ground, as chalk, whitening, *cinolia*, and plaster, are totally changed in their colours, and from green become brown; which contributes much to make the experiments tedious. I would therefore advise the use of mineral or metallic colours for this sort of painting, as most likely to preserve their colour: for although I neutralized Spanish white, by fermenting it with vinegar, and afterwards washed it very well with water, it did not succeed to my wish.

"These experiments, and this passage from Vitruvius, will in some measure explain the obscurity of part of that passage in Pliny which Dr Parsons, in his learned comment on the encaustic painting with wax, seems to despair of.

"*Ceris pingere*, was one species of encaustic painting. *Εγκαυρον, insulum*, may be translated, "forced in by the means of fire, burnt in;" for whatever is forced in by the help of fire can be rendered into Latin by no other significant word that I know of but *insulum*. If this is allowed me, and I think I have the authority of Vitruvius (a writer in the Augustine age) for it, who seems to have wrote from his own knowledge, and not like Pliny, who copied from others much more than he knew himself, the difficulty with regard to this kind of painting is solved, and the encaustic with burnt wax recovered to the public.

"What he means by the next kind he mentions, *in ebore cestro id est viriculo*, I will not attempt to explain at present.

"The ship-painting is more easily accounted for: the practice being in part continued to this time; and is what is corruptly called *breaining*, for brenning or burning.

"This is done by reeds set on fire, and held under the side of a ship till it is quite hot; then resin, tallow, tar, and brimstone, melted together, and put on with an hair brush while the planks remain hot, make such a kind of paint as Pliny describes: which, he says, *nec fole, nec sale, ventisque corrumpitur*. As they were ignorant of the use of oil-painting, they mixed that colour with the wax, &c. which they intended for each particular part of the ship, and put it on in the manner above described.

"In the pictures painted for these experiments, and now laid before your lordship and the society, I hope neither the design of the landscape, nor the execution of it, will be so much taken into consideration as the varnish (which was the thing wanted in this inquiry): and I think that will evince, that the encaustic paint-

(c) The account of the method of polishing [painting] walls coloured with vermilion, gave me great satisfaction, as it proved the method I had taken in experiment 8. (which I had tried before I saw or knew of this passage in Vitruvius) was right. The use of the candle, as I apprehend, was to melt the wax on the walls where by accident the brush had put on too much, or afford wax where the brush had not put on enough, or had left any part bare.

(d) The rubbing the wall with a linen cloth, while warm, will do very well, where there is only one colour to be preserved; but where there are many, as in a landscape, it will be apt to take off some, or render the colouring rather faint; which I found by wiping the wax off from a painting while it was hot.

Encaustic.

ing with burnt wax is fully restored by these experiments; and though not a new invention, yet having been lost for so many ages, and now applied further, and to other purposes, than it was by Vitruvius (who confined it to vermilion only), may also amount to a new discovery, the use of which may be a means of preserving many curious drawings to posterity: for this kind of painting may be on paper, cloth, or any other substance that will admit a ground to be laid on it. The process is very simple, and is not attended with the disagreeable smell unavoidable in oil-painting, nor with some inconveniences inseparable from that art; and as there is no substance we know more durable than wax, it hath the greatest probability of being lasting."

Still, however, there seem to have been some defects or inconveniences attending these and other subsequent attempts: for we find the ancient or some similar method of painting in wax remaining a desideratum upwards of 25 years after the publication of the preceding experiments; when in 1787 a method was communicated to the Society of Arts by Miss Greenland, for which she was rewarded with a prize. The ground of her information the received at Florence, through the acquaintance of an amateur of painting, who procured her the satisfaction of seeing some paintings in the ancient Grecian style, executed by Signora Parenti, a professor at that place, who had been instructed by a Jesuit at Pavia, the person who made the farthest discoveries in that art. Miss Greenland's friend knowing she was fond of painting, informed her what were the materials the painters used, but could not tell her the proportions of the composition; however, from her anxiety to succeed in such an acquisition, she made various experiments, and at last obtained such a sufficient knowledge of the quantities of the different ingredients as to begin and finish a picture, which she afterwards presented to the Society for their inspection.

Her method is as follows: "Take an ounce of white wax, and the same weight of gum mastic powdered. Put the wax in a glazed earthen vessel over a very slow fire; and when it is quite dissolved, stir in the mastic, a little at a time, stirring the wax continually until the whole quantity of gum is perfectly melted and incorporated: then throw the paste into cold water; and when it is hard, take it out of the water, wipe it dry, and beat it in one of Mr Wedgwood's mortars, observing to pound it at first in a linen cloth to absorb some drops of water that will remain in the paste, and would prevent the possibility of reducing it to a powder, which must be so fine as to pass through a thick gauze. It should be pounded in a cold place and but a little while at a time, as after long beating the friction will in a degree soften the wax and gum, and instead of their becoming a powder they will return to a paste.

"Make some strong gum-arabic water; and when you paint, take a little of the powder, some colour, and mix them together with the gum-water. Light colours require but a small quantity of the powder, but more of it must be put in proportion to the body and darkness of the colours; and to black there should be almost as much of the powder as colour.

"Having mixed the colours, and no more than can be used before they grow dry, paint with fair water, as is practised in painting with water-colours, a ground on

the wood being first painted of some proper colour prepared in the same manner as is described for the picture; walnut-tree and oak are the sorts of wood commonly made use of in Italy for this purpose. The painting should be very highly finished; otherwise, when varnished, the tints will not appear united.

"When the painting is quite dry, with rather a hard brush, passing it one way, varnish it with white wax, which is put into an earthen vessel, and kept melted over a very slow fire till the picture is varnished, taking great care the wax does not boil. Afterwards hold the picture before a fire, near enough to melt the wax, but not make it run; and when the varnish is entirely cold and hard, rub it gently with a linen cloth. Should the varnish blister, warm the picture again very slowly, and the bubbles will subside. When the picture is dirty, it need only be washed with cold water."

The opinion given by the Society upon the above is: The method made use of by Miss Greenland provides against all inconveniences; and the brilliancy of the colours in the picture painted by her, and exhibited to the Society, fully justifies the opinion, that the art of painting in wax, as above described, highly merited the reward of a gold pallot voted to her on this occasion.

ENCEINTE, in fortification, is the wall or rampart which surrounds a place, sometimes composed of bastions or curtains, either faced or lined with brick or stone, or only made of earth. The enceinte is sometimes only flanked by round or square towers, which is called a *Roman wall*.

ENCEPHALI, in medicine, worms generated in the head, where they cause so great a pain as sometimes to occasion distraction.

The encephali are very rare; but there are some diseases wherein they swarm; from whence we are told pestilential fevers have wholly arisen. Upon the dissection of one who died of this fever, a little, short, red worm was found in the head, which malmsey wine, wherein horse-radish had been boiled, could alone destroy. This medicine was afterwards tried on the sick, most of whom it cured.

The like worms have also been taken out by trepanning, and the patient cured. Those worms that generate in the nose, ears, and teeth, are also called *encephali*.

ENCHANTER, a person supposed to practise enchantment or fascination. See FASCINATION, WITCHCRAFT, &c.

ENCHANTER'S Nightshade, in botany. See CIRCÆA.

ENCHASING, INCHASING, or Chasing, the art of enriching and beautifying gold, silver, and other metal-work, by some design or figures represented thereon in low relieve.

Enchasing is practised only on hollow thin works, as watch-cases, cane-heads, tweezer-cases, or the like. It is performed by punching or driving out the metal, to form a figure, from within, so as to stand out prominent from the plane or surface of the metal. In order to this, they provide a number of fine steel blocks or puncheons of divers sizes; and the design being drawn on the surface of the metal, they apply the inside upon the heads or tops of these blocks, directly under the lines or parts of the figures; then, with a
fine

Enceinte
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Enchasing.

Enchirca

Endow-
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fine hammer, striking on the metal, sustained by the block, the metal yields, and the block makes an indenture or cavity on the inside, corresponding to which there is a prominence on the outside, which is to stand for that part of the figure.

Thus the workman proceeds to chafe and finish all the parts by the successive application of the block and hammer to the several parts of the design. And it is wonderful to consider with what beauty and justness, by this simple piece of mechanism, the artists in this kind will represent foliage, grotesques, animals, histories, &c.

ENCLITICA, in grammar, particles which are so closely united with other words as to seem part of them, as in *virumque*, &c.—There are three enclitic particles in Latin. viz. *que, ne, ve*.

ENCRATITES, in church-history, heretics who appeared towards the end of the second century: they were called *Encratites*, or *Continentes*, because they gloried in abstaining from marriage and the use of wine and animal-food.

ENCURECK, in natural history, a venomous insect found in Persia, and said to be a kind of tarantula. According to Olearius as quoted by Mr Boyle, it neither stings nor bites; but lets fall its venom like a drop of water, which causes insufferable pain in the part for a time, and afterwards to profound a sleep, that nothing can awake the patient except crushing one of the creatures on the part affected. It is nevertheless said, that the sheep eat these insects without damage.

ENCYCLOPÆDIA, a term nearly synonymous with *Cyclopædia*; but adopted in preference to it in denominating the present work, as being more definite and of better authority. According to an observation of the late learned printer Mr Bower, the preposition *EN* makes the meaning of the word more precise: For *Cyclopædia* may denote “the instruction of a circle,” as *Cyropædia* is “the instruction of Cyrus,” whereas in *Encyclopædia* the preposition determines the word to be from the dative of *cyclos*, “instruction in a circle.” And Vossius in his book *De vitis sermonis*, has observed, “That *Cyclopædia* is used by some authors, but *Encyclopædia* by the best.”

ENDEMIC, or ENDEMICAL, DISEASES, those to which the inhabitants of particular countries are subject more than others, on account of the air, water, situation, and manner of living.

ENDIVE, in botany. See *CICHORIUM*.

ENDLESS, something without an end: thus authors mention endless rolls, the endless screw, &c.

ENDOR, (anc. geog.), a town of Galilee, four miles to the south of mount Tabor; in the tribe of Manasseh, where the Pythoness was consulted by Saul: at this day, says Jerome, a large village.

ENDORSE, in heraldry, an ordinary, containing the eighth part of a pale, which Leigh says is only used when a pale is between two of them.

ENDORSED, in heraldry, is said of things borne back to back, more usually called *ADOSSE*.

ENDORSEMENT, in law and commerce. See *INDORSEMENT*.

ENDOWMENT, in law, denotes the settling a dower on a woman: though sometimes it is used figuratively, for settling a provision upon a parson, on the

building of a church; or the severing a sufficient portion of tithes for a vicar, when the benefice is appropriated.

ENDYMION, (fab. hist.), a shepherd, son of Æthlius and Calyce. It is said that he required of Jupiter to grant to him to be always young, and to sleep as much as he would; whence came the proverb of *Endymionis somnum dormire*, to express a long sleep. Diana saw him naked as he slept on mount Latmos; and was so struck with his beauty, that she came down from heaven every night to enjoy his company. Endymion married Chromia daughter of Itonus; by whom he had three sons Pæon, Epeus, and Æolus, and a daughter called *Eurydice*. The fable of Endymion's amours with Diana, or the moon, arose from his knowledge of astronomy; and as he passed the night on some high mountain to observe the heavenly bodies, it came to be reported that he was courted by the moon. Some suppose that there were two of that name; the son of a king of Elia, and the shepherd or astronomer of Caria. The people of Heraclea maintained that Endymion died on mount Latmos, and the Eleans pretended to show his tomb at Olympia in Peloponnesus.

ENEMY, in law, an alien or foreigner, who publicly invades the kingdom.

ENERGUMENS, in church-history, persons supposed to be possessed by the devil, concerning whom there were many regulations among the primitive Christians. They were denied baptism and the eucharist; at least, this was the practice of some churches: and though they were under the care of exorcists, yet it was thought a becoming act of charity, to let them have the public prayers of the church, at which they were permitted to be present. See *EXORCISM*.

ENERGY, a term of Greek origin, signifying the power, virtue, or efficacy of a thing. It is also used, figuratively, to denote emphasis of speech.

ENERVATING, the act of destroying the force, use, or office, of the nerves, either by cutting them, by weakening them with debauchery, or by some other violence.

Excess of wine, and other strong, hot, spirituous liquors, enervate or weaken the nerves. When they would render a horse useless, they enervate him, or cut his nerves.

ENFANS PERDUS, the same with forlorn-hope: See *FORLORN*.

ENFILADE, in the art of war, is used in speaking of trenches, or other places, which may be scourged by the enemy's shot along their whole length. In conducting the approaches at a siege, care must be taken that the trenches be not enfiladed from any work of the place.

ENFINE', formerly ANTINOË; a city of Egypt, built by Adrian in honour of his favourite Antinous. It is situated towards the middle of the Said, or Upper Egypt, and still contains several lately monuments of antiquity. In ancient times this city was very magnificent. It was about half a league in circumference, having two principal streets 45 feet wide, intersecting each other at right angles, and running thro' its whole length. The others were more narrow, but equally straight; the two largest having gates at each end, part of which still remain. According to the Nubian geographer, it

Endymion

Enfine.

Engine
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Engender-
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was called the city of the Magi, because Pharaoh is said to have caused the magicians come from thence to his court. Near it were the ruins of Abydus, where there was an oracle of the god Bese, one of the most ancient in Egypt, and which was still famous in the time of Constantius; and hence some have derived the appellation just mentioned, the neighbouring people coming in crowds to consult the oracle.

The ruins of the gates are the most beautiful pieces of architecture to be met with in this place. The handomest has three vaulted entries; the middle one being 40 feet in height, 22 wide, and 20 thick; the other two smaller. Each of the facades of this edifice is ornamented with four pilasters in bas relief, with Corinthian capitals, the acanthus leaves of which have a considerable projection. It was surrounded by eight Corinthian columns, of which only one now remains, but the pedestals of the rest are still entire. Besides these, there are heaps of rubbish in different parts of the town, apparently the remains of ancient temples or palaces. All these seem to have been bordered by a colonnade, forming a portico on each side, where the inhabitants might walk secure from the heat of the sun. One of the squares was ornamented with four large Corinthian pillars, three of which are destroyed all but the bases. The fourth is quite entire, about 50 feet high, and the shaft composed of several stones. The pedestal has a Greek inscription, pretty much defaced, dedicating it to the emperor Alexander Severus, to whom the senate of ALEXANDRIA had already dedicated the famous column mentioned under that article. These four other columns were therefore probably raised in honour of that emperor after his victories over the Persians; for the foliage of the oak, with which the first stone of the shaft is decorated, was a sign of victory among the Romans. Towards the end of the fourth century the city was peopled by Christians; and Palladius assures us, that there were at that place 12 convents of virgins, and several others inhabited by monks. In the environs there are still several coptic monasteries possessed by monks equally miserable and ignorant. The Nubian Geographer informs us, that the city was surrounded by a well cultivated country, abounding in fruits and harvests; but these have now given place to sands and barren deserts. The ruins of Abydus above mentioned are still to be seen near this place.

ENFRANCHISEMENT, in law, the incorporating a person into any society or body politic.

ENGASTRIMYTHI, in Pagan theology, the Pythians, or priestesses of Apollo, who delivered oracles from within, without any action of the mouth or lips.

The ancient philosophers, &c. are divided upon the subject of the engastrimythi. Hippocrates mentions it is a disease. Others will have it a kind of divination. Others attribute it to the operation or possession of an evil spirit. And others to art and mechanism. M. Scottus maintains that the engastrimythi of the ancients were poets, who, when the priests could not speak, supplied the defect by explaining in verse what Apollo dictated in the cavity of the bason on the sacred tripod.

ENGENDERING, a term sometimes used for the act of producing or forming any thing: thus meteors

are said to be engendered in the middle region of the atmosphere, and worms in the belly.

ENGINE, in mechanics, is a compound machine, made of one or more mechanical powers, as levers, pulleys, screws, &c. in order to raise, cast, or sustain any weight, or produce any effect which could not be easily effected otherwise. The word is formed of the French *engin*, from the Latin *ingenium* "wit;" by reason of the ingenuity required in the contrivance of engines to augment the effect of moving powers.

ENGINE for extinguishing Fires. See HYDROSTATICS, n^o 33.

Pile ENGINE, one contrived for driving piles. See PILE-ENGINE.

Steam-ENGINE, a machine to raise water by fire, or rather by the force of water turned into steam. See STEAM-ENGINE.

ENGINEER, in the military art, an able expert man, who, by a perfect knowledge in mathematics, delineates upon paper, or marks upon the ground, all sorts of forts, and other works proper for offence and defence. He should understand the art of fortification, so as to be able, not only to discover the defects of a place, but to find a remedy proper for them; as also how to make an attack upon, as well as to defend, the place. Engineers are extremely necessary for these purposes: wherefore it is requisite, that besides being ingenious, they should be brave in proportion. When at a siege the engineers have narrowly surveyed the place, they are to make their report to the general, by acquainting him which part they judge the weakest, and where approaches may be made with most success. Their business is also to delineate the lines of circumvallation and contravallation, taking all the advantages of the ground; to mark out the trenches, places of arms, batteries, and lodgments, taking care that none of their works be flanked or discovered from the place. After making a faithful report to the general of what is a-doing, the engineers are to demand a sufficient number of workmen and utensils, and whatever else is necessary.

ENGLAND, the southern division of the island of Great Britain. Including Wales, it is of a triangular form, and lies between the 50th and 55th degrees of north latitude, extending about 400 miles in length from south to north, and in some places it is 300 miles in breadth. It is bounded by Scotland on the north; by the English Channel on the south, dividing it from France; by the German Sea on the east; and on the west by St George's, or the Irish, Channel.

At what time the island of Britain was peopled is whence uncertain; nor do we know whether the southern or northern parts were first inhabited. We have no accounts that can be depended upon before the arrival of Julius Cæsar, and it is certain he found the southern parts full of people of a very warlike disposition. These people, according to Cæsar, were a colony of the Gauls; and this opinion is embraced by most of the ancient as well as modern writers. It is chiefly founded on the agreement observed by the Romans between the two nations in their customs, manners, language, religion, government, way of fighting, &c. The more northern inhabitants, according to Tacitus,

Engine
||
England.

England.
Inhabited
by 17 dif-
ferent na-
tions.

tus, came from Germany. This he infers from the make of their limbs; but Cæfar fimplly calls them *Aborigines*.

England, including the principality of Wales, when firft invaded by the Romans, was divided into 17 petty flates. 1. The *Danmonii*, called alfo *Dunmonii* and *Donmonii*, inhabiting the counties of Cornwall and Devonshire. 2. The *Durotriges*, who inhabited the track now called *Dorsetshire*. 3. The *Belge* poffeffed *Somersetshire*, *Wiltshire*, and *Hampshire*. 4. The *Attrebatii*, or inhabitants of *Berkshire*. 5. The *Regni*, whose country bordered on that of the *Attrebatii*, and comprehended *Surrey*, *Suffex*, and part of the fea-coaft of *Hampshire*. 6. The *Cantii*, inhabiting the county now called *Kent*. 7. The *Dobuni* are placed by *Ptolemy* on the north fide of the *Thames*, near its head, in the counties of *Gloucestershire* and *Oxfordshire*. 8. The *Catticuchani*, *Calyceubani*, *Cattidudani*, or *Cathcludani*, inhabited *Buckinghamshire*, *Bedfordshire*, and *Hertfordshire*. 9. The *Trinobantes*, who poffeffed the counties of *Effex* and *Middlefex*. 10. The *Iceni*, whose country comprehended *Suffolk*, *Norfolk*, *Cambridge*, and *Huntingdonshire*. Thefe are by *Ptolemy* called *Simeni*, and by others *Tigeni*. *Camden* is of opinion, that they were the fame whom Cæfar calls *Cenomagni*. 11. The *Coritani*, whose country comprehended *Northamptonshire*, *Lucestershire*, *Rutlandshire*, *Lincolnshire*, *Nottinghamshire*, and *Derbyshire*. 12. The *Cornavii* poffeffed *Warwickshire*, *Worcestershire*, *Staffordshire*, *Shropshire*, and *Cheshire*. 13. The *Silures* inhabited the counties of *Radnorshire*, *Brecknockshire*, *Glamorganshire*, with *Herefordshire* and *Monmouthshire*. 14. The *Demetæ* inhabited part of *Camardifhire*, *Pembrokeshire*, and *Cardiganfhire*. 15. The country of the *Ordovices* comprehended *Montgomeryshire*, *Merionethshire*, *Caernarvonshire*, *Denbighshire*, and *Flintshire*. 16. The *Brigantes* poffeffed the countries of *Yorkshire*, the bifhopric of *Durham*, *Lancashire*, *Westmoreland*, and *Cumberland*. 17. The country of *Northumberland* was held by the *Ottadini*, *Ottadeni*, or *Ottalini*. Their country, according to fome, reached from the *Tine* to the river *Forth*; though the moft common opinion is, that it reached only to the *Tweed*.

The above-mentioned names of thefe nations are plainly Roman, but the etymology of them is not eafily afcertained. Some attempt to derive them from words in the Old *British* language; but as this fubject at beft muft be very obfcure and uncertain, we fhall not enter into it.

Before the time of *Julius Cæfar*, the Romans had fcarcely any knowledge of *Britain*; but that conqueror having fubdued moft of the *Gallie* nations on the oppofite fide of the channel, began to think of extending his conquelts by the reduction of *Britain*. The motive for this expedition, afcribed to him by *Suetonius*, was a defire of enriching himfelf by the *British* pearls, which were then very much efteemed. The pretence, however, which he made ufe of in order to juftify his invafion was, that the Britons had fent affiftance to the Gauls during his wars with them.

Cæfar undertook his firft expedition againft *Britain* when the fummer was already far fpent, and therefore he did not expect to finifh the conquelt of the country that campaign. He thought, however, that it would

England.

be a confiderable advantage to view the ifland, and learn fomething of the manners and cuftoms of the natives; after which he could more eafily take fuch meafures as would enfore a permanent conquelt on his return. Having marched all his forces into the country of the *Morini*, now the province of *Picardy*, from whence was the fhorteft paffage into *Britain*; he ordered at the fame time all the veffels that lay in the neighbouring ports, and a fleet which he had built the year before for an expedition againft the *Morini*, to attend him. The Britons, alarmed at his preparations, fent ambaffadors with offers of fubmiffion; but Cæfar, though he received them with great kindnefs, did not abandon his intended fcheme of an invafion. He waited till the arrival of *C. Volufenus*, whom he had fent out with a fingle galley to make difcoveries on the coaft. *Volufenus* did not think proper to land; but, having made what obfervations he could, returned after five days abfence, and Cæfar immediately fet fail for *Britain*. His force confifted of two legions embarked on board 80 tranfports; and he appointed 18 more which lay wind-bound about eight miles off, to convey over the cavalry; but thefe laft orders were too flowly executed, which occafioned fome difficulty in his landing.

The Britons at this time, according to Cæfar and other Roman hiftorians, were very numerous, and had their country well ftocked with cattle. Their houfes refembled thofe of the Gauls; and they ufed copper or iron plates weighed by a certain ftandard inftead of money. Their towns were a confufed parcel of huts placed at a fmall diftance from one another, generally in the middle of a wood, to which all the avenues were fightly guarded with ramparts of earth, or with trees. All the nations were in a ftate of the moft wretched barbarifm, even when compared with the barbarous Gauls on the continent. The ufe of clothes was fcarce known in the ifland. Only the inhabitants of the fouthern coaft covered their nakednefs with the fkins of wild beafts; and this rather to avoid giving offence to the ftangers who came to trade with them, than out of any principle of decency. It was a general cuftom among the Britons to paint their bodies with the juice of woad; but whether this was defigned as ornament, or for any other purpofe, is not known. They fhaved their beards, all except their upper lip, and wore long hair. They alfo had their wives in common, a cuftom which made them deteftable to all other nations.

The arms of the Britons were a fword, a fhort lance, and a fhield. Breaf-plates and helmets they looked upon rather to be incumbrances, and therefore made no ufe of them. They ufually fought in chariots, fome of which were armed with fcythes at the wheels; they were fierce and cruel, and exceedingly blood-thirftly. When driven to diftrefs, they could fubfift themfelves even on the bark and roots of trees; and *Dio Caffius* tells us, that they had ready, on all occafions, a certain kind of food, of which, if they took but the quantity of a bean, they were not troubled with hunger or thirft for a confiderable time after. The fouthern nations, however, were fomewhat more civilized; and the *Cantii*, or inhabitants of *Kent*, more fo than any of the reft.

All the *British* nations at this time were very brave and

Manners,
cuftoms,
&c. of the
Britons.

Julius Cæ-
far under-
takes an ex-
pedition in-
to Britain.

England.

and resolute, owing to the continual dissensions among themselves. They proved therefore very formidable enemies to the Romans; but the same dissensions which had taught them the art of war, also prevented them from uniting in the defence of their country. As soon as they perceived Cæsar's fleet approaching, a number of cavalry and chariots were dispatched to oppose his landing, while a considerable body of infantry hastened after. What chiefly embarrassed the Romans in their attempt to land, was the largeness of their ships, which required a considerable depth of water. The soldiers therefore were obliged to leap into the sea while loaded with their armour; and at the same time to encounter the enemy, who were quite disengaged, as they either stood on dry ground, or waded but a little way into the water. Cæsar perceiving this disadvantage, ordered his galleys to advance, with their broad sides towards the shore, in order to drive the Britons from the water-side with their slings and arrows. On this the Britons, surprised at the galleys, a sort of shipping they had never before seen, began to give ground. The fight, however, continued for some time, greatly to the disadvantage of the Romans; till at last Cæsar, observing the distress of his men, caused several boats to be manned, and sent them to the assistance of those who were most exposed to the enemy's assault. The Romans then soon got the better of the undisciplined barbarians, however brave, and made good their landing; but they were unable to pursue the enemy for want of cavalry, which had not yet arrived.

6
They are
defeated
and sue for
peace.

The Britons were so disheartened with this bad success, that they immediately sent ambassadors to sue for peace; which was granted, on condition of their delivering a certain number of hostages for their fidelity. Part of these they brought immediately; and promised to return in a few days with the rest, who, they said, lived at some distance. But, in the mean time, the 18 transports which carried Cæsar's cavalry, being driven back by a violent storm, and the fleet which lay in the road being greatly damaged by the same, the Britons thought proper to break their engagements. Having therefore privately assembled their forces, they fell unexpectedly on the seventh legion while at a distance from the rest and busied in foraging. Cæsar being apprised of their danger, hastened to their assistance with two cohorts, and at last repulsed the enemy.—This, however, proved only a temporary deliverance; for the Britons, thinking it would be possible for them to cut off all the Romans at once, dispatched messengers to inform several of the neighbouring nations of the weakness of the enemy's forces, and the happy opportunity that offered itself of destroying all these invaders at one blow.—On this, they drew together a great body of horse and foot, which boldly advanced to the Roman intrenchments. But Cæsar came out to meet them; and the undisciplined Britons being by no means able to cope with the Romans, were put to flight with great slaughter. Having burnt several towns and villages, the victors returned to their camp, where they were soon followed by new deputies from the Britons. Cæsar being in want of horse, and afraid lest another storm should destroy the remainder of his fleet, granted them peace, on condition of their sending him double the number

N^o 115.

of hostages into Gaul which they had before promised. The same night he set sail, and soon arrived safe in Gaul.

The Britons no sooner perceived the Romans gone, than, as before, they broke through their engagements. Of all the states who had promised to send hostages, only two performed their promises; and this neglect provoked Cæsar, that he determined to return the year following with a far greater force. Having, therefore, caused his old vessels to be refitted, and a great many new ones to be built, he arrived off the coast of Britain with a fleet of 600 ships and 28 galleys. The Britons made no opposition to his landing; but Cæsar, getting intelligence that an army was assembled at no great distance, marched in quest of them. He found them encamped on the banks of a river, supposed to be the *Stour*, about 12 miles distant from the place where he had landed. They attempted to oppose his passage; but being briskly attacked by the Roman cavalry, they were obliged to retire into a wood, all the avenues of which were blocked up by trees cut down for that purpose. This fortification, however, proved insufficient to protect them. The seventh legion having cast themselves into a testudo, and thrown up a mound against their works, drove them from their asylum; but as the day was far spent, a pursuit was not thought advisable.

8
Cæsar re-
turns.

9
Defeats the
Britons.

Next morning Cæsar, with the greatest part of his army, which he divided into three bodies, marched out in quest of the enemy. But when he was already come in sight of their rear, he was overtaken by messengers, who informed him, that his fleet was greatly damaged by a violent storm which had happened the preceding night. This put an end to the pursuit for that time; but Cæsar having employed all the carpenters he had with him, and sent for others from Gaul, in order to repair the damage, resolved to prevent misfortunes of this kind for the future. He therefore drew all his ships ashore, and inclosed them within the fortifications of his camp. This arduous undertaking employed his whole army for 10 days; after which he again set out in quest of the enemy.

The Britons had made the best use they could of the respite afforded them by the storm. They were headed by Cassibelanus king of the Trinobantes. He had formerly made war upon his neighbours; and having rendered himself terrible to them, was looked upon to be the most proper person for leading them on against the common enemy; and as several states had now joined their forces, the British army was very numerous. Their cavalry and chariots attacked the Roman army while on their march; but were repulsed with loss, and driven into the woods. The Romans pursued them too eagerly, and thus lost some of their own men; which encouraged the Britons to make another fierce attack; but in this also they were finally unsuccessful, and obliged to retire, though their loss seems not to have been great.

Next day the Britons suddenly attacked the Roman legions as they were foraging; but meeting with a vigorous resistance, they soon betook themselves to flight. The Romans pursued them so closely, that having neither time to rally nor get down from their chariots according to custom, great numbers of them were cut in pieces; and this overthrow had such an effect upon the auxiliaries

England.

auxiliaries of Cassibelanus, that all of them abandoned him; nor did the Britons ever afterwards engage Cæsar with united forces. Cæsar, pursuing his victory, marched towards the Thames, with a design to cross that river, and enter the territories of the Trinobantes. The river was fordable only at one place, and that not without great difficulty; but when he came to it, he found the enemy's forces drawn up in a considerable body on the opposite bank, which was fortified with sharp stakes. They had likewise driven many stakes of the same kind into the bottom of the river, the tops of which were covered with water. These stakes are visible to this day at a place called *Walton* in *Surry*. They are made of oak; and though they have been so long in the water, are as hard as Brazil, and as black as jet; and have sometimes been pulled out in order to make knife-handles of them.

II
Gives the
Britons fre-
quent over
throws.

Cæsar was not at all dismayed at these difficulties, which he had intelligence of by prisoners and deserters. He ordered the cavalry to enter first, and the foot to follow. His orders were obeyed, and the soldiers advanced with such resolution, that though the infantry were up to the chin in water, the enemy, unable to sustain their assault, abandoned the bank and fled. After this defeat, Cassibelanus himself despairing of success, and therefore dismissed all his forces except about 4000 chariots, with which he observed the motions of the Romans, harassing them by cutting off straggling parties, &c. This, however, was not sufficient to keep up the spirits of his countrymen. On the contrary, they deposed him from the kingdom, and chose Mandubratius, whose father had been murdered by Cassibelanus, who thereupon usurped the kingdom. The young prince had fled to Cæsar, who gave him protection; and the Trinobantes now offered to submit to the conqueror, provided he would give them Mandubratius for their king.

Cæsar readily complied with the request of the Trinobantes upon their sending him 40 hostages: and the submission of the Trinobantes was soon followed by that of other states and tribes; for each of the 17 nations already mentioned were composed of several different tribes, of which no particular account can be given.—Cæsar next marched to *Verulamium*, or *Canterbury*, which was Cassibelanus's capital, and which he still kept possession of; but tho' the place was strongly fortified both by nature and art, the Britons were unable to bear the assault of the Romans, and therefore soon fled out at one of the avenues. Many were taken as they attempted to make their escape, and many more cut in pieces.

After this loss, Cassibelanus, as his last resource, found means to draw into confederacy with him four kings of the *Canti*. But though Cæsar gives them the title of kings, it is probable that they were only petty princes, tributary to the king of that nation. Their names were *Cingetorix*, *Corvilius*, *Taximagulus*, and *Segonax*. These, having raised what forces they could, attacked the camp where the ships were laid up; but the Romans having made a sally, repulsed them with great slaughter, and then returned to their trenches without any loss; after which, Cassibelanus thought proper to submit to the conqueror. As the summer was already far spent, Cæsar hearkened to his proposals. A peace was concluded on the follow-

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ing terms, viz. that the Britons should pay an annual tribute to the Romans, that Cassibelanus should leave Mandubratius in peaceable possession of his dominions, that he should not molest the Trinobantes, and that he should deliver a certain number of hostages. These terms being agreed to, Cæsar set sail with his whole fleet from Britain, to which he never returned.

England.

12
He leaves
the island
altogether.

Such is the account given by Cæsar himself of his two expeditions into Britain; but other authors have spoken very doubtfully of his victories in this island. Dio Cassius tells us, that the Britons utterly defeated the Roman infantry, but were at last put in disorder by their cavalry. Horace and Tibullus, in many parts of their works, speak of the Britons as a people not yet conquered. Tacitus says, that Cæsar rather showed the Romans the way to Britain, than put them in possession of it; and Lucan tells us plainly, that Cæsar turned his back to the Britons and fled. This last, however, considering the consummate military genius of Cæsar, is by no means probable. That he left Britain during the winter, was, in all probability, to prevent insurrections among the Gauls, which might very readily have happened; and that he did not return to finish his conquest can be no wonder, seeing his ambition would certainly be more gratified by being called emperor of Rome, than conqueror of Britain.

The departure of Julius Cæsar, which happened about 53 years before Christ, left the Britons without any fear of a foreign enemy. We are not, therefore, to imagine, that they would regard their promises of paying tribute; nor was it probably demanded for a good number of years afterwards. Augustus, however, when he had got himself fully established on the throne, had twice a design of invading Britain and forcing the inhabitants to pay the tribute promised to Julius Cæsar. Both times, however, he was prevented by revolts in different provinces in the empire, so that the Britons still continued to enjoy their liberty. They thought proper, however, to court the favour of the Romans as much as they could by pretended submissions; but, in the reign of Claudius, the Romans set about reducing them to subjection in good earnest. The occasion of this war is related by Dio Cassius as follows. "Cunobelinus, the third in succession from Cassibelanus, being dead, his two sons, Togodunnus and Caracatus, succeeded to the throne; but whether they reigned jointly or separately, is not known. In their reign one Bericus, of whom we also know very little, being driven out of the island for attempting to raise a sedition, fled with some of his partisans to Rome, and persuaded Claudius to make war on his countrymen. The Britons, on the other hand, resented the behaviour of Claudius in receiving these vagabonds, and therefore prohibited all intercourse with the Romans. A much smaller offence than this would have been sufficient at any time to provoke that haughty nation to declare war. An army was therefore immediately ordered into Britain under the command of Plautius prætor in Gaul. The soldiers at first refused to embark, from a superstitious notion, that they were going to be sent without the compass of the world; and this mutiny being related to the Britons, they did not make the necessary preparations for their own defence. The Roman soldiers were soon brought to a sense of their duty; and set out from three different ports, in order

13
Why the
war with
the Romans
was renewed.

4 E

to

England.

to land in three different places of Britain at once. Being driven back by contrary winds, their fears began to return; but they refused their courage on the appearance of a meteor shooting from the east, which they imagined was sent from heaven to direct their course. They landed without opposition; and the Britons, not having drawn together a sufficient army, kept in small bodies behind their marshes, and in woods, in order to spin out the war till winter; which they imagined Plautius would, like Cæsar, spend in Gaul.

14
The Britons de-
fected.

The Roman general marched first in quest of the two kings Togodumnus and Caratacus; both of whom he found out, and defeated one after another. He then reduced part of the Dobuni, at that time subject to the Cattiæchlani; and leaving a garrison to keep them in awe, he advanced to a river where the Britons lay carelessly encamped, supposing that the Romans could not pass it without a bridge. But the Germans in the Roman army had been accustomed to swim across the strongest currents in their heavy armour. They therefore passed the river first; and having, according to their orders, fallen only upon the enemy's horses which drew their chariots, these formidable machines were rendered entirely useless; and the Britons were put to flight as soon as another part of the forces could pass the river.

The Britons were not disheartened with this defeat, but engaged the Romans next day with great bravery. Victory continued long doubtful; but at length the Romans prevailed, and the Britons were forced to betake themselves to flight. This battle is thought to have been fought on the banks of the Severn. From thence the Britons fled to the mouth of the Thames. They were closely pursued by the Romans; but the latter being unacquainted with the flats and shallows of the river, were often in great danger. The Germans, however, crossed by swimming as before, and the rest on a bridge somewhat farther up the river; so that the Britons were in a short time surrounded on all sides, and great numbers of them cut in pieces. Many of the Romans, also, pursuing the fugitives with too great eagerness, were lost in the marshes.—In one of these battles Togodumnus was killed; but the Britons were so far from being disheartened, that they showed more eagerness than ever to oppose the Romans, in order to revenge his death. Plautius, therefore, did not think proper to penetrate farther into the country, but contented himself with putting garrisons in the places he had already conquered. He then wrote to the emperor himself; who no sooner received an account of his success, than he set out for Britain; where, having landed after a short voyage, he joined Plautius on the banks of the Thames.

15
Claudius
arrives in
Britain.

Soon after the arrival of Claudius, the Romans passed the Thames, attacked the British army, and totally defeated it. The consequence of this was the taking of Cunobelinus's capital, and the submission of several of the neighbouring states. The emperor, however, did not make a long stay in the island, but left Plautius to pursue his conquests. This he did with such success, that, on his return to Rome, he was met without the gates by the emperor himself, who, at his solemn entry, gave him the right hand.—The Britons seem to have made a very obstinate resistance to the Roman arms about this time. Vespasian, who

was afterwards emperor, is said to have fought 30 battles with them; and the exploits of Titus his son are also much celebrated by the Roman historians.

England.

In the ninth year of Claudius, P. Ostorius Scapula was sent into Britain. By far the greater part of the 17 nations formerly mentioned were at this time unconquered. Some of these had broken into the Roman territories; but Ostorius falling unexpectedly upon them, put great numbers to the sword, and dispersed the rest. To prevent them for the future from making inroads into the territories of the Romans or their allies, he built several forts on the Severn, the Avon, and the Nen, reducing the country south of these rivers to a Roman province. This so highly offended the Iceni, that, being joined by the neighbouring nations, they raised a considerable army, and encamped in an advantageous situation, in order to prevent the Romans from penetrating farther into the island. Ostorius, however, soon advanced against them. The Romans, as usual, got the victory, and the enemy were pursued with great slaughter. The Roman general then, having quelled an insurrection among the Brigantes, led his army against the Silures. They were headed by their king Caratacus, a most renowned warrior. He showed his military talents by choosing a very advantageous place for engaging the enemy. Ta-

16
Caratacus
ofsted
and taken
prisoner.

citus tells us, "it was on the ridge of an exceeding steep mountain; and where the sides of it were inclining and accessible, he reared walls of stone for a rampart. At the foot of the mountain flowed a river dangerous to be forded, and an army of men guarded his entrenchments." This hill is thought to be one called *Caer-Caradoc* in Shropshire, situated near the conflux of the rivers Colun and Teme, and where the remains of ancient entrenchments are still visible.—On the approach of the enemy, Caratacus drew up his troops in order of battle, animating them with the following speech, according to Tacitus. "That from this day, and this battle, they must date their liberty rescued, or their slavery for ever established. He then invoked the shades of those heroes who had expelled Cæsar the dictator; those brave men by whose valour they still enjoyed freedom from Roman tribute and taxes, and by which their wives and children were as yet preserved from prostitution." The whole army then took a solemn oath either to conquer or die, and prepared for the charge with the most terrible shouts. Ostorius was somewhat dismayed when he considered the uncommon fierceness of the enemy, and the other difficulties which he had to encounter. He led on his men, however, to the charge; and the Romans were attended with their usual good fortune. The Britons were put to flight. Vast numbers fell on the field of battle and in the pursuit, and many more were taken prisoners. Among the latter were the wife, the daughter, and the brothers, of Caratacus. The unfortunate prince himself fled to Cartimundia queen of the Brigantes, by whom he was delivered up to the Roman general, who sent him in chains to Rome. Caratacus bore his misfortunes with magnanimity; and when he came before the emperor, addressed him in the following terms. "If my moderation in prosperity, O his speech
Claudius! had been as conspicuous as my birth and my fortune, I should now have entered this city as a friend, and not as a prisoner; nor would you have disdained
rur.

the

England.

the friendship of a prince descended from such illustrious ancestors, and governing so many nations. My present condition, I own, is to you honourable, to me humiliating. I was lately possessed of subjects, horses, arms, and riches. Can you be surprised that I endeavoured to preserve them? If you Romans have a desire to arrive at universal monarchy, must all nations, to gratify you, tamely submit to servitude? If I had submitted without a struggle, how much would it have diminished the lustre of my fall, and of your victory? And now, if you resolve to put me to death, my story will soon be buried in oblivion; but if you think proper to preserve my life, I shall remain a lasting monument of your clemency."—This speech had such an effect upon Claudius, that he immediately pardoned Caractacus and his whole family, and commanded them to be set at liberty.

18
General re-
volt of the
Britons.

The Silures, notwithstanding this terrible blow, continued the war with great vigour, and gained considerable advantages over the Romans; which so much affected Ostorius, that he died of grief. He was succeeded by A. Didius, who restrained the incursions of the Silures, but was not able to restore Cartimundua queen of the Brigantes, who had been deposed by her subjects. Didius was succeeded by Veranus, and he by Suetonius Paulinus, who reduced the island of **ANGLESEY**, as related under that article. But while Paulinus was employed in the conquest of this island, he was alarmed by the news of an almost universal revolt among those nations which had submitted to the Romans. The Britons, tho' conquered, had still a desire of returning to their former state of independence; and the Roman yoke became every day more unsupportable to them through the insolence and oppressions of the Roman soldiers. The Britons had been long discontented, and were already in a very proper disposition for a revolt, when an event happened which kindled these discontents into an open flame. Prasutagus, king of the Iceni, a prince renowned for opulence and grandeur, had, by his last will, left the Roman emperor joint-heir with his two daughters, in hopes of obtaining his favour and protection by so great an obligation. But the event turned out very different. No sooner was he dead, than his houses and possessions were all plundered by the Roman soldiers. The queen Boadicea remonstrated against this injustice; but, instead of obtaining any redress, she herself was publicly whipped, her daughters ravished, and all the relations of the late king reduced to slavery. The whole country also was plundered, and all the chiefs of the Iceni deprived of their possessions.

Boadicea was a woman of too haughty a spirit tamely to bear such indignities. She therefore persuaded the Iceni to take up arms, which they very readily did. Then, being joined by the Trinobantes, and some other nations, they poured like a torrent on the Roman colonies. Every thing was destroyed with fire and sword. The ninth legion, which had been left for the defence of the country under Petilius Cerealis, was defeated, the infantry totally cut in pieces, and the commander himself with the cavalry escaped with the utmost difficulty. Suetonius, alarmed at this news, immediately left Anglesey, and marched with the greatest expedition to London. The inhabitants were overjoyed at his arrival, and used their utmost endeavours

to detain him for their defence. But he refused to stay, and in a short time left the place, notwithstanding the intreaties of the inhabitants. The whole city lamented his departure; and they had reason. Suetonius was scarce gone, when Boadicea with her Britons entered, and put all they found in it to the sword. None were taken prisoners, nor was any sex or age spared, and many were tortured in the most cruel manner. Seventy thousand persons are said to have perished on this occasion at London and other Roman colonies.

The Britons, now elated with success, assembled from all quarters in great numbers, so that Boadicea's army soon amounted to 230,000 men. They despised the Romans; and became so confident of victory, that they brought their wives and children along with them in waggons to be spectators of the destruction of their enemies. The event was what might naturally have been expected from such ill-judged confidence. The Britons were overthrown with most terrible slaughter, no fewer than 80,000 being killed in the battle and pursuit; while the Romans had not above 400 killed, and not many more wounded. Boadicea, not able to survive so great a calamity, put an end to her life by poison.

By this overthrow the Britons who had once been subdued were thoroughly prevented from raising any more insurrections, and even those who had not yet submitted to the Roman yoke seemed to be intimidated from making incursions into their dominions. Nothing remarkable therefore happened for some time. In the time of Vespasian, Petilius Cerealis being appointed governor of Britain, attacked the Brigantes, defeated them in several battles, and reduced great part of their country. He was succeeded by Julius Frontinus; who not only maintained the conquests of his predecessor, but reduced entirely the warlike nation of the Silures. Frontinus was succeeded by the celebrated Cneius Julius Agricola, who completed the conquest of all the southern Britons.

Just before the arrival of Agricola, the Ordovices had cut in pieces a band of horse stationed on their confines, after which the whole nation had taken arms. The summer was pretty far spent, and the Roman army was quite separated and dispersed, the soldiers having assured themselves of rest for the remaining part of the year. Agricola, however, was no sooner landed, than, having drawn together his legions, he marched against the enemy without delay. The Britons kept upon the ridges of the mountains; but Agricola led them in person up the ascents. The Romans were victorious; and such a terrible slaughter was made of the Britons that almost the whole nation of Ordovices was cut off. Without giving the enemy time to recover from the terror which this overthrow had occasioned, Agricola resolved upon the immediate reduction of Anglesey, which had been lost by the revolt of Boadicea. Being destitute of ships, he detached a chosen body of auxiliaries who knew the fords, and were accustomed to manage their arms and horses in the water. The Britons, who had expected a fleet and transports, were so terrified by the appearance of the Roman forces on their island, that they immediately submitted, and Anglesey was once more restored to the Romans.

With the conquest of Anglesey ended the first campaign.

England.

19
They de-
stroy 70,000
Romans.

20
They are
utterly de-
feated.

21
Britain con-
quered by
Agricola.

England.

paign of Agricola; and he employed the winter in reconciling the Britons to the Roman yoke. In this he met with such success, through his wife and equitable conduct, that the Britons, barbarous as they were, began to prefer a life of security and peace, to that independency which they had formerly enjoyed, and which continually exposed them to the tumults and calamities of war. The succeeding campaigns of Agricola were attended with equal success; he not only subdued the 17 nations inhabiting England, but carried the Roman arms almost to the extremity of Scotland. He also caused his fleet to sail round the island, and discovered the Orkades, or Orkney islands, which had before been unknown to the rest of the world. His expedition took him up about six years, and was completed in the year of Christ 84.

Had this commander been continued in Britain, it is probable that both Scotland and England would have been permanently subdued; but he was recalled by Domitian in the year 85; and we are then almost totally in the dark about the British affairs till the reign of the emperor Adrian. During this interval the Caledonians had taken arms, and not only refused subjection to the Roman power themselves, but ravaged the territories of the Britons who continued faithful to them. Adrian, for what reason is not well known, abandoned to them the whole track lying between the Tyne and the Forth. At the same time, in order to restrain them from making incursions into the Roman territories, he built a wall 80 miles in length from the river Eden in Cumberland to the Tyne in Northumberland *.

* See *Adrian*.

† See *Antoninus's wall*.

He was succeeded by Antoninus Pius, in whose reign the Brigantes revolted; and the Caledonians, having in several places broken down the wall built by Adrian, began anew to ravage the Roman territories. Against them the emperor sent Lollius Urbicus, who reduced the Brigantes; and having defeated the northern nations, confined them within narrower bounds by a new wall †, extending probably between the friths of Forth and Clyde. From the time of Antoninus to that of Severus, the Roman dominions in Britain continued to be much infested by the inroads of the northern nations. That emperor divided Britain into two governments, the southern and northern; but the governor of the northern division was so harassed by continual incursions of the Caledonians, that he was at length obliged to purchase a peace with money. The Caledonians kept the treaty for 15 years; after which, breaking into the Roman territories anew, they committed terrible ravages. Virius Lupus the governor, not being in a condition to withstand them, acquainted the emperor with his distress, intreating him to send powerful and speedy supplies. Upon this Severus resolved to put an end to the perpetual incursions of the enemy by making a complete conquest of their country; for which purpose he set out for Britain, together with his two sons Caracalla and Geta, at the head of a numerous army. The Caledonians no sooner heard of his arrival, than they sent ambassadors offering to conclude a peace upon honourable terms. But these the emperor detained till he was ready to take the field, and then dismissed them without granting their request.

As soon as the season was fit for action, Severus

marched into the territories of the Caledonians, where he put all to fire and sword. He advanced even to the most northerly parts of the island; and though no battle was fought in this expedition, yet through the continual ambuscades of the enemy, and the inhospitable nature of the country, he is said to have lost 50,000 men. At last the Caledonians were obliged to sue for peace; which was granted them on condition of their yielding part of their country, and delivering up their arms. After this the emperor returned to York, leaving his son Caracalla to command the army, and finish the new wall which had been begun between the friths of Forth and Clyde. But the emperor being taken ill at York, the Caledonians no sooner heard of his indisposition, than they again took up arms. This provoked Severus to such a degree, that he commanded his son Caracalla to enter their country anew with the whole army, and to put all he met to the sword without distinction of sex or age. Before these orders, however, could be put in execution, his two sons, having concluded a shameful peace with the Caledonians, returned to Rome.

A long chasm now takes place in the history of the Roman dominions in Britain. In the beginning of Dioclesian's reign, Carausius a native of Gaul, passing over into Britain, took upon him the title of emperor, and was acknowledged by all the troops quartered here. He was, however, killed in a battle with one of Constantius's officers, after he had enjoyed the sovereignty for six or seven years. Constantine the Great began his reign in this island; and returned home after he had left it, probably with a design to put a stop to the daily incursions of the Caledonians. He altered the division of that part of Britain subject to the Romans. Severus had divided it only into two provinces; but Constantine increased the number to three: viz. Britannia Prima, Britannia Secunda, and Maxima Cæsariensis; and this last was afterwards divided into two, viz. Maxima Cæsariensis and Flavia Cæsariensis. The removal of the imperial seat from Rome to Constantinople, which happened in the reign of Constantine, gave the northern nations an opportunity of making frequent incursions into the Roman provinces; the emperor having carried with him, first into Gaul, and then into the East, not only most of the Roman troops, but likewise the flower of the British youth.

About the latter end of the reign of Constantius son to Constantine the Great, the government of the province of Britain and other western parts of the empire, was committed to Julian, afterwards called the *apostate*. While he was in his winter-quarters at Paris, he was informed that the Scots and Picts, about this time first distinguished by these names, had broken into the Roman territories and committed every where dreadful ravages. Against them Julian dispatched a body of troops under the command of Lupicinius. He embarked from Bologne in the depth of winter, but was no sooner arrived at London than he was recalled; the enemy having probably found means to appease Julian by their submissions. Till the reign of Valentinian I. these nations still continued to infest the Roman territories in Britain, and had now reduced the country to a most deplorable condition by their continual ravages. Valentinian sent against them Theodosius, father to the emperor of that name. That general

England.

22
Expedition
of Severus
into Bri-
tain.

ral

ral having divided his forces into several bodies, advanced against the enemy, who were roving up and down the country. The Scots and Picts were obliged to yield to the superior valour and discipline of the Romans. Great numbers were cut in pieces; they were forced to abandon all the booty and prisoners they had taken, and to retire beyond the friths of Forth and Clyde. Theodosius then entered London in triumph, and restored that city to its former splendor, which had suffered greatly by the former incursions of the northern Britons. To restrain them from breaking anew into the provinces, Theodosius built several forts or castles between the two friths; and having thus recovered all the country between Adrian's wall and the friths of Forth and Clyde, he formed of it a fifth province which he called *Valentia*.

Though Britain was now reduced to a state of temporary tranquillity, yet as the Roman empire was daily declining, it is not to be supposed that sufficient care could be taken to secure such a distant province. In the reign of the emperor Honorius, the provincial Britons found themselves annoyed not only by the Scots and Picts, but also by the depredations of the Saxons, who began to commit ravages on the sea-coasts. By the care, however, of Stilicho, prime minister to Honorius, matters were once more settled, and a particular officer was appointed to guard the coast against the attempts of the Saxons, with the title of *Comes limitis Saxonici*. But, not long after, the empire being over-run by barbarians, most of the Roman troops quartered in Britain were recalled, and the country left quite open to the attacks of the Scots and Picts. Upon this the provincials expecting no more assistance from Honorius, resolved to set up an emperor of their own. Accordingly they invested with the imperial dignity one *Mark*, an officer of great credit among them. Him they murdered in a few days, and placed on the throne one Gratian a native of Britain. After a reign of four months, Gratian underwent the fate of his predecessor; and was succeeded by *Constantine*, a common soldier, who was chosen merely for the sake of his name. He seems, however, to have been a man of some knowledge and experience in war. He drove the Scots and Picts beyond the limits of the Roman territories; but being elated with this success, he would now be satisfied with nothing less than the conquest of the whole Roman empire. He therefore passed over into Gaul; and took with him not only the few Roman forces that had been left, but such of the provincial Britons as were most accustomed to arms. That unhappy people, being now left entirely defenceless, were harassed in the most cruel manner by their enemies; who broke into the country, and destroyed all with fire and sword. In this miserable situation they continued from the year 407, when the usurper Constantine passed over into Gaul, till the year 410. Having during the last three years frequently implored assistance from Rome without receiving any, they now resolved to withdraw their allegiance from an empire which was no longer able to protect them. Honorius himself applauded their conduct; and advised them by letters to provide for their own safety, which was in effect an implicit resignation of the sovereignty of the island.

The provincial Britons now regained their liberty;

but they had lost the martial spirit which had at first rendered them so formidable to the Romans. They seem, however, to have met with some success in their first enterprises; for Zosimas tells us, that they delivered their cities from the insults of an haughty enemy. But being at last overpowered, they were again obliged to have recourse to the Roman emperor, to whom they promised a most perfect submission, provided they were delivered from the hands of their merciless and implacable enemies. Honorius, touched with compassion, sent a legion to their relief. The Roman forces landed in Britain unexpectedly; and having destroyed great numbers of the Scots and Picts, they drove them beyond the friths of Forth and Dunbritton. After this they advised the natives to build a wall on the isthmus from sea to sea, and to reassume their courage, and defend themselves from their enemies by their own valour. The Romans then quitted the country; being obliged to return, in order to repulse those barbarians who had broken into the empire from all quarters.

The Britons immediately set about building the wall, as they had been desired, with great alacrity. But as it was constructed only of turf, the Scots and Picts soon broke it down in several places; and, pouring in upon the defenceless and effeminate provincials, committed more cruel ravages than ever. At last, after very many and grievous calamities, the latter sent ambassadors once more to Rome. These appeared with their garments rent and dust on their heads; and at last prevailed on the emperor, by their earnest intreaties, to send another legion to their relief. The troops arrived in Britain before the enemy had the least knowledge of their having set sail. They were therefore quite unprepared for an attack, and roving up and down the country in the utmost disorder. The Romans made a terrible havoc among them, and drove the remainder into their own country. As Honorius had sent them not with any ambitious view of retaining the island in subjection, but merely out of compassion to the unhappy provincials, the Romans told them, they had now no farther assistance to expect from them. They informed them, that the legion must immediately return to the continent, to protect the empire from the barbarians, who had extended their ravages almost to every part of it; and therefore, that they must now take their last farewell of Britain, and totally abandon the island. After this declaration Gallio, the commander of the Roman troops, exhorted the provincials to defend themselves, by fighting bravely for their country, wives, and children, and what ought to be dearer than life itself, their liberty; telling them, at the same time, that their enemies were no stronger than themselves, provided they would but lay aside their fears, and exert their ancient courage and resolution. That they might the better withstand the attacks of the enemy, he advised them to build a wall, not of turf, but of stone; offering to assist them with his soldiers, and to direct them himself in the execution. Upon this the Britons immediately fell to work; and with the assistance of the Romans, finished it in a short time, though it was no less than eight feet thick, and twelve feet in height. It is thought to have been built on the same place where Severus's wall formerly stood. Towers were also built at convenient

24
Emplorethe
assistance
of the Ro-
mans.

25
Send am-
bassadors a
second time
to Rome.

23
The Bri-
tons choose
an emperor
of their
own.

England.

26
Britain finally abandoned by the Romans.

venient distances on the east coast, to prevent the descents of the Saxons and other barbarians that came from Germany. Gallio employed the rest of his time in teaching the provincials the art of war. He left them patterns of the Roman weapons, which he also taught them to make; and after many encouraging exhortations, he took his last farewell of Britain, to which the Romans never returned. There is a great disagreement among chronologists as to the year in which the Romans finally abandoned Britain; some placing it in 422; others in 423; or 426; and some in 431, 435, or 437.

The final departure of the Romans was no sooner known to the Scots and Picts, than they poured in upon the provincial Britons from all quarters, like hungry wolves breaking into a sheep-fold. When the Scots approached the new built-wall, they found it completely finished, and guarded by great numbers of armed men. But so little had the provincial Britons profited by the military instructions of the Romans, that instead of placing proper guards and centinels, and relieving one another by turns, their whole number had fled several days and nights upon the ramparts without intermission. Being therefore quite benumbed and

27
Britons miserably harassed by the Scots and Picts.

wearied out, they were able to make but very little resistance. Many were pulled down with hooks from the battlements, and dashed in pieces. The rest were driven from their stations with showers of darts and arrows. They betook themselves to flight; but that could not save them. The Scots and Picts pursued them close, made a dreadful havoc among the fugitives, and took possession of the frontier towns, which they found deserted by the inhabitants. As they now met with no more opposition, they over-ran the whole country, putting every thing to fire and sword. Their ravages soon occasioned a famine; and this was followed by a kind of civil war. The provincials, unable to support themselves, were obliged to plunder each other of the little the common enemy had left them. The whole country at last became so incapable of supporting those who were left in it, that many fled into the woods, in order to subsist themselves there by hunting.

28
Implore the assistance of the Romans.

In this extremity of distress, they had once more recourse to the Romans; and wrote in the most mournful style that can possibly be imagined to Aetius, who was then consul the third time. Their letter they directed thus: "The groans of the Britons to the consul Aetius." The contents of this letter were answerable to the direction. "The barbarians (say they) drive us to the sea; the sea drives us back to the barbarians; between which we have only the choice of two deaths, either to be swallowed up by the waves, or to be cruelly massacred by the enemy."

To this letter the Roman general gave no satisfactory answer; and the provincials were thereupon reduced to despair. Great numbers of them fled over to Armorica, where they settled along with others who had formerly gone over with an usurper called *Maximus*; while others submitted to the Scots and Picts. Some, however, more resolute than the rest, had once more recourse to arms. They fellied out in parties from the woods and caves where they had been obliged to hide themselves, and, falling unexpectedly on the enemy, cut great numbers of them in pieces, and obliged the rest to retire. Having thus obtained some respite,

29
They at last repulse their enemies.

they began again to cultivate their lands; which, having lain fallow for a long time, now produced all sorts of corn in the greatest plenty. This plenty, according to the historian Gildas, occasioned the most consummate wickedness and corruption of manners among all ranks of men. The clergy, says he, who should have reclaimed the laity by their example, proved the ringleaders in every vice; being addicted to drunkenness, contention, envy, &c.—It is possible, however, that this description might be exaggerated by Gildas, who was himself a monk. But however this was, the Britons had not long enjoyed peace, when they were alarmed by a report, that the Scots and Picts were about to return with a far greater force than before, utterly to extirpate the name of their southern neighbours, and seize upon the country for themselves. This report threw them into a terrible consternation; and to add to the rest of their misfortunes, they were now visited by a dreadful plague, which raged with such violence, that the living were scarce sufficient to bury the dead. The contagion no sooner ceased, than they found their country invaded by the Scots and Picts, who destroyed every thing with fire and sword; so that the provincials were soon reduced to the same miserable state they had formerly been in.

England.

30
Are again threatened with an invasion.

At this time the chief, if not the only, king of the southern division of Britain, was one *Vortigern*. He is said to have been a cruel, debauched tyrant, regardless of the public welfare, and totally incapable of promoting it. Being now roused from his sensibility, however, by a sense of his own danger, he summoned a council of the chief men of the nation, in order to deliberate about the proper means for delivering the country from those calamities under which it groaned. In this council the most pernicious measure was adopted that could possibly have been resolved on; namely, to invite to their assistance the *Saxons*, a people famous for their piracies and cruelty, and justly dreaded by the Britons themselves*. This fatal expedient being agreed upon, ambassadors were immediately dispatched into Germany with advantageous proposals to the Saxons in case they would come over to their assistance.

31
They resolved to call in the Saxons.

* See Saxons.

The British ambassadors soon arrived in Germany, and, according to Witichind, a Saxon historian of the ninth century, made the following speech before an assembly of the Saxons.—"Illustrious Saxons, the same of your victories having reached our ears, the distressed Britons, harassed by the continual inroads of a neighbouring enemy, send us to implore your assistance. We have a fertile and spacious country, which we are commanded to submit to you. We have hitherto lived under the protection of the Roman empire; but our ancient masters having abandoned us, we know no nation more powerful than you, and better able to protect us. We therefore recur to your valour. Forfake us not in our distress, and we shall readily submit to what terms you yourselves shall think fit to prescribe to us."—If this abject and shameful speech was really made, it must give us a very strange idea of the national spirit of the provincial Britons at that time. It is, however, probable that the whole is a fiction, designed only to excuse the perfidious treatment which these Britons afterwards received from the Saxons.

Saxons.

England.

Saxons. The most respectable even of the Saxon historians make no mention of such a speech; and it is certain, that when the Saxons themselves wanted to quarrel with the Britons, they never insisted upon the promise made by the British ambassadors; which they most certainly would have done, had any such promise ever been made.

The British ambassadors were very favourably received by the Saxons. The latter embraced their proposal with joy; and the rather, because their foothlayers foretold that they should plunder their British allies for 150 years, and reign over them for twice that time. Three long ships, in the Saxon language called *chulter*, were therefore fitted out, under the conduct of Hengist and Horsa. These were two brothers much celebrated both for their valour and nobility. They were sons of Witigilf, said to be great-grandson to the Saxon god Woden; a circumstance which added much to their authority. Having embarked about 1600 men on board their three vessels, the two brothers arrived in the isle of Thanet, in the year 449 or 450.

32
The Saxons
arrive in
Britain, and
defeat the
Scots and
Picts.

They were received by the inhabitants with the greatest demonstrations of joy: the isle in which they had landed was immediately appointed for their habitation; and a league was concluded, in virtue of which the Saxons were to defend the provincial Britons against all foreign enemies; and the provincials were to allow the Saxons pay and maintenance, besides the place allotted them for their abode. Soon after their arrival, king Vortigern led them against the northern nations who had lately broke into the kingdom, and advanced as far as Stanford in the county of Lincolnshire. Here a battle was fought, in which the Scots and Picts were utterly defeated, and obliged to relinquish their booty.

Vortigern was so highly pleased with the behaviour of his new allies, that he bestowed large possessions in the country they had newly delivered, upon the two commanders Hengist and Horsa. It is said, that, even at this time, Hengist was taken with the wealth and fertility of the country; and at the same time observing the inhabitants to be quite enervated with luxury, began to entertain hopes of conquering part of it. He therefore, with Vortigern's consent, invited over some more of his countrymen; giving them notice at the same time of the fruitfulness of the country, the effeminacy of the inhabitants, and how easily a conquest might be effected.

33
New sup-
plies of
Saxons ar-
rive.

The Saxons readily complied with the invitation; and, in 452, as many more arrived in 17 vessels, as with those already in Britain, made up an army of 5000 men. Along with these, according to Nennius, came over Rowena the daughter of Hengist. Vortigern fell in love with this lady; and in order to obtain her in marriage, divorced his lawful wife. Hengist pretended to be averse to the match; but Vortigern obtained his consent by investing him with the sovereignty of Kent. The Saxon historians, indeed, make no mention of Rowena; but rather insinuate, that their countrymen made themselves masters of Kent by force of arms. It seems most probable, however, that Vortigern had as yet continued in friendship with the Saxons, and even put more confidence in them than in his own subjects. For, not long after the arrival of this first reinforcement, Hengist obtained leave

to send for a second, in order, as was pretended, to defend the king from the attempts of his rebellious subjects, as well as of the Scots and Picts. These embarked in 40 ships, under the command of Oeta and Ebusa, the son and nephew, or, according to some, the brother and nephew of Hengist. They landed at the Orkney islands; and having ravaged them, as well as all the northern coasts of Scotland, they conquered several places beyond the Frith, and at last obtained leave to settle in Northumberland.

The pretence made for this settlement was, that the Saxons under Oeta and Ebusa might defend the northern frontiers of the kingdom, as those under Hengist and Horsa did the southern parts. Many more Saxons were, under various pretences, invited over; till at last the countries from which they came were in a manner depopulated. And now their numbers being greatly increased, the Saxons began to quarrel with the natives. They demanded larger allowances of corn, and other provisions; threatening to lay waste the whole country if their demands were not complied with. The Britons, instead of complying with these demands, desired them to return home, since their numbers exceeded what they were able to maintain. Upon this, the Saxons concluded a peace with the Scots and Picts; and, turning their arms against the unhappy provincials, over-ran the whole country. The Saxons committed every where the greatest cruelties. All buildings, whether public or private, they levelled with the ground. The cities were pillaged and burnt; and the people massacred without distinction of sex or age, and that in such numbers, that the living scarce sufficed to bury the dead. Some of those who escaped the general slaughter, took refuge among inaccessible rocks and mountains; but there great numbers perished with hunger, or were forced to surrender themselves as slaves to their enemies. Some crossed the sea and settled either in Holland or in Armorica, now the province of Brittany in France.

Vortigern, we are told by Nennius, was so far from being reclaimed by these calamities, that he added incit to his other crimes, and married his own daughter. At last, his own subjects, provoked at his enormous wickedness, and the partiality he showed to the Saxons, deposed him, and raised his son Vortimer to the throne. He was a young man of great valour, and willingly undertook the defence of his distressed country. He first fell upon the Saxons with what troops he could assemble, and drove them into the isle of Thanet. Here they were besieged, till, being reinforced by fresh supplies from Germany, they opened themselves a way through the British troops. Vortimer, however, was not yet disheartened. He engaged the Saxons on the banks of the Derwent in Kent, where he obtained a complete victory, and cut in pieces great numbers of the enemy. Another battle was fought at Aylesford in Kent. Some ascribe the victory at this time to the Saxons, and some to the Britons. It is certain, however, that Horsa the brother of Hengist was killed in this engagement. He is said to have been buried at a place in the neighbourhood, which from him obtained the name of *Horsled*.—A third battle was fought, in which the victory was uncertain, as is also the place where it happened. The fourth battle, however, according to Nennius, proved decisive

England.

34
They quar-
rel with
the Bri-
tons.

35
They are
defeated
and driven
out by Vor-
timer.

decisive

England.

decisive in favour of the Britons. Vortimer engaged his enemies, according to some, at Folkstone; according to others, at a place called *Stonar*, in the isle of Thanet. The Saxons were defeated with great slaughter, and driven back to their ships. So complete is this victory said to have been, that the Saxons quitted the island, without making any attempt upon it for five years afterwards. These battles, however, rest entirely upon the credit of Nennius, and the historians who have followed him. They are taken notice of neither by Gildas nor Bede. The former only acquaints us, that the Saxons retired. This, by most historians, is understood of their returning home; tho' it is possible he might mean no more, than that, after they had laid waste the country, they retired into the territories allotted them by Vortigern, in Kent and Northumberland.

Vortigern is said to have died after a reign of fix years. On his death-bed, he desired his servants to bury him near the place where the Saxons used to land; being persuaded, that the virtue of his bones would effectually prevent them from ever touching the British shore. This command, however, was neglected; and Vortimer was buried at Lincoln, according to some, or London, according to others. Hengist was no sooner informed of his death, than he invaded Britain anew with a numerous body of Saxons. He was opposed by Vortigern, who had been restored to the throne after the death of his son Vortimer. Several battles were fought on this occasion; but at last the provincials being overthrown at a place called *Creamford*, with the loss of 4000 men, were obliged to abandon Kent to their enemies, and retire to London. This happened about the year 458 or 459; and from this time most historians date the erection of the first Saxon kingdom in Britain, viz. that of Kent. Hengist assumed the title of *king*, and chose *Esk* his son for his colleague.

The Britons under Vortigern still continued the war. Hengist finding himself unable to gain a decisive advantage over them in the field, had recourse to treachery. He pretended to be desirous of concluding a peace with the British monarch, and of renewing his ancient friendship with him; and therefore required an interview. To this Vortigern readily consented, and accepted of an entertainment prepared for him by Hengist. The king was attended by 300 nobility all unarmed, but the Saxons had concealed daggers below their garments. The British nobility were all treacherously massacred in the height of their mirth; Vortigern himself was taken and put in fetters; nor could his liberty be procured, but by ceding to the Saxons those provinces now called *Essex*, *Sussex*, and *Middlesex*. Thus the Saxons got such a footing in Britain that they could never afterwards be expelled. Vortigern, after being set at liberty, is said to have retired to a vast wilderness near the fall of the Wye in Radnorshire, where he was some time after consumed by lightning, together with a city called *Kaer Gourtigern* which he had built in that place.

On the retreat of Vortigern, the command of the British forces devolved upon Aurelius Ambrosius, or, as Gildas calls him, Ambrosius Aurelianus. He was a Roman, and perhaps the last that remained in the island. He is said to have gained several victories over the

Saxons. Notwithstanding this, however, they still continued to gain ground; and in the year 491, the foundation of a second Saxon kingdom was laid in Britain. This at first comprehended only the county of *Sussex*, but soon after extended over most of the countries lying south of the Humber. It was called the *kingdom of the South Saxons*.

The German nations being now informed of the good success which had attended the Saxons in Britain, new adventurers daily flocked over to share the good fortune of the others. They were chiefly composed of three nations, the Saxons, Angles, and Jutes. All these passed under the common appellation sometimes of *Saxons*, sometimes of *Angles*. They spoke the same language, and agreed very much in their customs and institutions, so that all of them were naturally led to combine against the natives. The most active of these adventurers was *Cerdic* a Saxon, said to be the tenth in descent from Woden. He landed with his son *Cenric*, and as many men as he could convey in five ships, at Yarmouth in Norfolk. The provincials immediately attacked him with great vigour; but after a short engagement, they were totally defeated. Many other battles were fought, the event of which was always favourable to the Saxons, so that the Britons were forced to abandon their sea-coasts to them.

In 497, *Porta*, another Saxon, with his two sons *Bleda* and *Magla*, arrived at *Portsmouth*, so called, as some imagine, from this chieftain. The provincials, under the command of a young prince a native of the country, attempted to oppose the landing of the Saxons; but his army was defeated with great slaughter, and he himself killed in the engagement; after which *Porta* made himself master of all the neighbouring country. The progress of *Cerdic*, however, alarmed the Britons more than that of all the other Saxon princes. About the year 508, therefore, *Nazaleod*, styled, by Henry of Huntingdon, the *greatest of all the British kings*, assembled almost the whole strength of the provincial Britons in order to drive him out of the island. *Cerdic* on the other hand took care to strengthen himself by procuring assistance from all the Saxons already in the island. He then advanced against the Britons, commanding the right wing himself, and his son *Cenric* the left. As the two armies drew near each other, *Nazaleod* perceived the enemy's right wing to be much stronger than the left. He therefore attacked it with the flower of his army; and after an obstinate resistance, obliged *Cerdic* to save himself by flight. Being too eager in the pursuit, however, *Cenric* fell upon his rear, and the battle was renewed with great vigour. The British army was at last entirely defeated; and 5000 men, among whom was *Nazaleod* himself, were left dead on the spot.

Who succeeded *Nazaleod* in the kingdom of Britain, is not known. The Welsh annals leave an interregnum of about six years; after which they place the beginning of the reign of *Arthur*, the most renowned British prince mentioned in history. The history of whether king *Arthur* is so much obscured by fables, and many absurd, romantic, and ridiculous stories, that some have supposed that no such person ever existed. On this subject Milton gives the following reasons against the existence of king *Arthur*: 1. He is not mentioned by Gildas,

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38
Second Sax-
on king-
dom.

36
They re-
turn and
defeat the
Britons,
and erect
a kingdom
in Kent.

37
Treachery
of the Sax-
ons.

39
About
the year 508,
therefore, *Nazaleod*,
king of
Britain de-
feated and
killed.

40
Whether
king *Arthur*
is so much
obscured by
fables, and
many absurd,
romantic, and
ridiculous
stories, that
some have
supposed that
no such person
ever existed.

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Gildas, or any British historian except Nennius, who is allowed on all hands to have been a very credulous writer, and to have published a great many fables. 2. Though William of Malmesbury and Henry of Huntingdon have both related his exploits, yet the latter took all he wrote from Nennius; and the former, either from the same fabulous writer, or some Monkish legends in the abbey of Glasterbury; for both these writers flourished several centuries after king Arthur. 3. In the pretended history of Geoffroy of Monmouth, such contradictions occur concerning this monarch's victories in France, Scotland, Ireland, Norway, Italy, &c. as must cause us to look upon him as an hero altogether fabulous and romantic.

In answer to this it has been said, 1. That his not being mentioned by Gildas cannot seem strange to us, seeing it was not that author's design to write an exact history of his country, but only to give a short account of the causes of its ruin by the Scots, Picts, and Saxons. He had also a particular system to support, namely, That the ruin of the Britons was owing to the judgments of God upon them for their wickedness. He lies therefore under a great temptation to conceal the successes of the Britons, and to relate only their misfortunes. 2. Though Nennius was a credulous writer, it is unreasonable to think that the whole history of king Arthur was an invention of his. It is more probable that he copied it from other more ancient authors, or took it from the common tradition of his countrymen. That the Saxon annals make no mention of this king is not to be wondered at, seeing it is natural to think that they would wish to conceal the many defeats he gave their nation. 3. The most convincing proof of the existence of king Arthur is, that his tomb was discovered at Glasterbury in Somersetshire, and his coffin dug up, in the reign of Henry II. with the following inscription upon it in Gothic characters: "Hic jacet sepultus inclutus rex Arturius in insula Avalonia." We are told that on his body were plainly to be seen the marks of 10 wounds, only one of which seemed to be mortal.

43
His ex-
ploits.

42
Five other
Saxon king-
doms crec-
ted.

This renowned prince is said to have defeated the Saxons under Cerdic in 12 pitched battles. The last of these was fought on Badon-hill, supposed to be Banfdown near Bath; in which the Saxons received such a terrible overthrow, that for many years they gave the Britons no further molestation. As new supplies of Saxons, however, were continually flocking over, a third and fourth kingdom of them were soon formed. The third kingdom comprehended the counties of Devon, Dorset, Somerset, Wiltshire, Hampshire, and Berkshire; to which was afterwards added Cornwall. This was called the *kingdom of the West Saxons*. The other kingdom, which was called the *kingdom of the East Saxons*, comprehended Essex, Middlesex, and part of Hertfordshire.

In the year 542, happened the death of the great king Arthur, said to have been killed in battle with a treacherous kinsman of his own. Five years afterwards, was erected the Saxon kingdom of Northumberland. It extended, however, much farther than the present bounds of that country; for it comprehended all Yorkshire, Lancashire, Durham, Cumberland, Westmoreland, and Northumberland, with part of Scotland, as far as the frith of Forth. Between these Saxon,

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kingdoms frequent contentions now arose; by which means the Britons enjoyed an uninterrupted tranquillity for at least 44 years. This interval, however, according to Gildas, they employed only in corrupting their manners more and more, till at last they were roused from their security by the setting up of a sixth Saxon kingdom, called the kingdom of the *East Angles*. It was founded in 575, and comprehended the counties of Norfolk, Suffolk, Cambridgehire, and the Isle of Ely. The Saxons once more attacked the Britons, and overthrew them in many battles. The war was continued for ten years; after which, another Saxon kingdom called *Mercia* was set up. It comprehended 17 counties; viz. Gloucester, Hereford, Worcester, Warwick, Leicester, Rutland, Northampton, Lincoln, Huntingdon, Bedford, Buckingham, Oxford, Stafford, Nottingham, Derby, Shropshire, Cheshire, and part of Hertfordshire.

The provincial Britons were now confined within very narrow bounds. However, before they entirely gave up the best part of their country to their enemies, they once more resolved to try the event of a battle. At this time they were assisted by the Angles, who were jealous of the overgrown power of the West Saxons. The battle was fought in Wiltshire, at Woden's Bearth, a place near the ditch called *Wanfdike* or *Wodenfdike*; which runs through the middle of the county. The battle was very obstinate and bloody; but at last the Saxons were entirely defeated, and almost their whole army cut off. The victory, however, proved of little service to the Britons: for being greatly inferior in number to the Saxons, and harassed by them on the one side, and by the Scots and Picts on the other, they were daily more and more confined; and at last obliged to take refuge among the craggy and mountainous places in the west of the island, where their enemies could not pursue them. At first they possessed all the country beyond the rivers Dee and Severn, which anciently divided Cambria, or Wales, from England; the towns which stand on the eastern banks of these rivers having mostly been built in order to restrain the incursions of the Welsh. But the English, having passed the Severn, by degrees seized on the country lying between that river and the Wye. Nay, in former time, some parts of Flintshire and Denbighshire were subject to the kings of Mercia: for Uffa, the most powerful king of that country, caused a deep ditch to be drawn, and a high wall built, as a barrier between his dominions and the territories of the Welsh, from the mouth of the Dee, a little above Flint-castle, to the mouth of the Wye. This ditch is still to be seen in several places; and is called by the Welsh *Clauds Uffa*, or the Ditch of Uffa. The inhabitants of the towns on the east side of this ditch are called by the same people *Guyr y Mers*; that is, the men of Mercia.

43
The Britons
defeat the
Saxons, but
are obliged
to retire in-
to Wales.

Thus, after a violent contest of near 150 years, the Saxons entirely subdued the Britons whom they had come to defend, and had erected seven independent kingdoms in England, now commonly denominated the *Saxon Heptarchy*. By these conquerors the country was now reduced to a degree of barbarity almost as great as it had been in when first invaded by the Romans. The provincial Britons, during their subjection to that people, had made considerable advances in civilization,

44
Account of
the heptar-
chy.

England.

vilization. They had built 28 considerable cities, besides a number of villages and country-seats; but now these were all levelled with the ground, the native inhabitants who remained in England were reduced to the most abject slavery, and every art and science totally extinguished among them.

Before these fierce conquerors could be civilized in any degree, it was necessary that all the seven kingdoms should be reduced under one head; for as long as they remained independent, their continual wars with each other still kept them in the same state of barbarity and ignorance.

The history of these seven kingdoms affords no event that can be in the least intersting. It consists only of a detail of their quarrels for the sovereignty. This was at last obtained by Egbert king of the West Saxons, or Wessex, in 827. Before this time, Christianity had been introduced into almost all the kingdoms of the heptarchy; and however much corrupted it might be by coming through the impure channel of the church of Rome, and misunderstanding through the ignorance of those who received it, it had considerably softened the barbarous manners of the Saxons. It had also opened a communication between Britain and the more polite parts of Europe, so that there was now some hope of the introduction of arts and sciences into this country. Another effect was, that, by the ridiculous notions of preserving inviolable chastity even between married people, the royal families of most of the kingdoms were totally extinct; and the people, being in a state of anarchy, were ready to submit to the first who assumed any authority over them.

All these things contributed to the success of Egbert in uniting the heptarchy under his own dominion. He was of the royal family of Wessex; and a nearer heir than Brithric, who had been raised to the kingdom in 784. As Egbert was a prince of great accomplishments, Brithric, knowing that he had a better title to the crown than himself, began to look upon him with a very jealous eye. Young Egbert, sensible of his danger, privately withdrew to France; where he was well received by Charlemagne, the reigning monarch. The French were reckoned at this period the most valiant and polite people in Europe; so that this exile proved of great service to Egbert.

He continued at the court of France till he was recalled by the nobility to take possession of the kingdom of Wessex. This recall was occasioned by the following accident. Brithric the king of Wessex had married Eadburga, natural daughter of Offa king of Mercia; a woman infamous for cruelty and incontinence. Having great influence over her husband, she often persuaded him to destroy such of the nobility as were obnoxious to her; and where this expedient failed, she herself had not scrupled to become their executioner. She had mixed a cup of poison for a young nobleman, who had acquired a great share of her husband's friendship: but, unfortunately, the king drank of the fatal potion along with his favourite, and soon after expired. By this and other crimes Eadburga became so odious to the people, that she was forced to fly into France, whence Egbert was at the same time recalled, as above mentioned.

Egbert ascended the throne of Wessex in the year

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799. He was the sole descendant of those conquerors who first invaded Britain, and who derived their pedigree from the god Woden. But though this circumstance might have given him great advantages in attempting to subdue the neighbouring kingdoms, Egbert for some time gave them no disturbance; but turned his arms against the Britons, who had retired into Cornwall, whom he defeated in several battles. He was recalled from his conquests in that country, by hearing that Bernulf king of Mercia had invaded his dominions. Egbert quickly led his army against the invaders, whom he totally defeated at Ellendun in Wiltshire. He then entered their kingdom on the side of Oxfordshire with an army, and at the same time sent his eldest son Ethelwolf with another into Kent. The young prince expelled Baldred the tributary king of Kent, and soon made himself master of the country. The kingdom of Essex was conquered with equal ease; and the East Angles, who had been reduced under subjection by the Mercians, joyfully put themselves under the protection of Egbert. Bernulf himself marched against them, but was defeated and killed; and Luðcan his successor met with the same fate two years after.

These misfortunes greatly facilitated the reduction of Mercia. Egbert soon penetrated into the very heart of the Mercian territories, and gained an easy victory over a dispirited and divided people; but in order to engage them to submit with the less reluctance, he allowed Wiglaf, their countryman, to retain the title of king, whilst he himself exercised the real power of a sovereign. Northumberland was at present in a state of anarchy; and this tempted Egbert to carry his victorious arms into that kingdom also. The inhabitants, being desirous of living under a settled form of government, readily submitted, and owned him for their sovereign. To them, however, he likewise allowed the power of electing a king; who paid him a tribute, and was dependent on him.

Egbert became sole master of England about the year 827. A favourite opportunity was now offered to the Anglo-Saxons of becoming a civilized people, as they were at peace among themselves, and seemed free from any danger of a foreign invasion. But this flattering prospect was soon overcast. Five years after Egbert had established his new monarchy, the Danes landed in the isle of Shepey, plundered it, and then made their escape with safety. Encouraged by this success, next year they landed from a fleet of 35 ships. They were encountered by Egbert at Charnouth in Dorsetshire. The battle was obstinate and bloody. Great numbers of the Danes were killed, but the rest made good their retreat to their ships. They next entered into an alliance with the Britons of Cornwall; and landing two years after in that country, they made an irruption into Devonshire. Egbert met them at Hengedown, and totally defeated them; but before he had time to form any regular plan for the defence of the kingdom, he died, and left the government to his son Ethelwolf.

The new king was weak and superstitious. He began with dividing the kingdom; which had so lately been united, with his son Athelstan. To the young prince he gave the counties of Essex, Kent, and Sussex. But though this division might have been productive of

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of bad consequences at another time, the fear of the Danes kept every thing quiet for the present. These barbarians had some how or other conceived such hopes of enriching themselves by the plunder of England, that they scarce ever failed of paying it an annual visit. The English historians tell us, that they met with many severe repulses and defeats; but on the whole it appears that they had gained ground: for in 851 a body of them took up their winter-quarters in England. Next year they received a strong reinforcement of their countrymen in 350 vessels; and advancing from the isle of Thanet, where they had stationed themselves, they burnt the cities of London and Canterbury. Having next put to flight Brichtic the governor of Mercia, they marched into the heart of Surrey, laying waste the whole country through which they passed.

Ethelwolf, though naturally little fitted for military enterprises, was now obliged to take the field. He marched against the Danes at the head of the West Saxons, and gained an indecisive and bloody victory over his enemies. The Danes still maintained their settlement in the isle of Thanet. They were attacked by Ealher and Huda, governors of Kent and Surrey; both of whom they defeated and killed. Afterwards they removed to the isle of Sheppey, where they took up their winter-quarters, with a design to extend their ravages the next year.

The deplorable state of the kingdom did not hinder Ethelwolf from making a pilgrimage to Rome, whither he carried his fourth and favourite son Alfred, then only six years of age. He passed a twelvemonth in that city; made presents to the principal ecclesiastics there; and made a grant of 300 mancuses (a silver coin about the weight of our half-crown) annually to the see of Rome. One-third of this was to support the lamps of St Peter's, another those of St Paul's, and the third was for the Pope himself. In his return to England, Ethelwolf married Judith, daughter of the emperor Charles the Bald; but when he landed, he found himself deprived of his kingdom by his son Ethelbald. That prince assumed the government of Athelstan's dominions, who was lately dead; and, with many of Ethelwolf's nobles, formed a design of excluding him from the throne altogether, on account of his weakness and superstitions. Ethelwolf, however, delivered the people from the calamities of a civil war, by dividing the kingdom with his son. He gave to Ethelbald the government of the western, and reserved to himself that of the eastern part of the kingdom. Immediately after this, he summoned the states of the whole kingdom, and conferred on the clergy a perpetual donation of tithes, for which they had long contended, and which had been the subject of their sermons for several centuries.

This concession was deemed so meritorious by the English, that they now thought themselves sure of the favour of heaven; and therefore neglected to use the natural means for their safety which they might have done. They even agreed, that, notwithstanding the desperate situation of affairs at present, the revenues of the church should be exempted from all burdens, though imposed for the immediate security and defence of the nation. Ethelwolf died two years after he had made the above mentioned grant, and left the

kingdom to his two eldest sons Ethelbald and Ethelbert. Both these princes died in a few years, and left the kingdom to Ethelred their brother, in the year 866.

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The whole course of Ethelred's reign was disturbed by the irruptions of the Danes. The king defended himself against them with great bravery, being seconded in all his military enterprises by his younger brother Alfred, who afterwards ascended the throne. In this reign, the Danes first landed among the East Angles. That people treacherously entered into an alliance with the common enemy; and furnished them with horses, which enabled them to make an irruption into Northumberland. There they seized upon the city of York. Olbriht and Ella, two Northumbrian princes who attempted to rescue the city, were defeated and killed. Encouraged by this success, the Danes penetrated into the kingdom of Mercia, took up their winter-quarters at Nottingham, and thus threatened the kingdom with a final subjection. From this post, however, they were dislodged by Ethelred and Alfred, who forced them to retire into Northumberland. Their restless and savage disposition, however, did not suffer them to continue long in one place. They broke into East Anglia; defeated and took prisoner Edmund the tributary king of that country, whom they afterwards murdered; and committed every where the most barbarous ravages. In 871, they advanced to Reading; from whence they infected the neighbouring country by their incursions. The Mercians, desirous of recovering their independency, refused to join Ethelred with their forces; so that he was obliged to march against the Danes, attended only by the West Saxons, who were his hereditary subjects. Several actions ensued, in which the Danes are said to have been unsuccessful; but being continually reinforced from their own country, they became every day more and more formidable to the English. During the confusion and distress in which the nation was now necessarily involved, king Ethelred died of a wound he had received in an action with the Danes; and left to his brother Alfred the kingdom almost totally subdued by a foreign power.

Alfred, who may properly be called the founder of Alfred the English monarchy, ascended the throne in the year Great 871, being then only 22 years of age. His great virtues and shining talents saved his country from ruin, which seemed almost unavoidable. His exploits against the Danes, his dangers and distresses, are related under the article ALFRED. Having settled the nation in a much better manner than could have been expected, he died in 901, leaving the kingdom to his second son Edward the Elder.

The beginning of this monarch's reign was disturbed by those intestine commotions from which the wife and elder politic Alfred had taken so much pains to free the nation. Ethelwald, son to king Ethelbert, Alfred's elder brother, claimed a right to the throne. Having armed his partisans, he took possession of Winburne, where he seemed determined to hold out to the last extremity. On the approach of Edward, however, with a powerful army, he first fled into Normandy, and afterwards into Northumberland. He hoped to find the Northumbrians ready to join him, as most of them were Danes, lately subdued by Alfred, and very impatient of peace. The event did not disappoint his expectations.

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pections. The Northumbrians declared for him; and Ethelwald having thus connected himself with the Danish tribes, went beyond sea, whence he returned with a great body of these banditti. On his return, he was joined by the Danes of East Anglia and Mercia. Ethelwald, at the head of the rebels, made an irruption into the counties of Gloucester, Oxford, and Wilts; and having ravaged the country, retired with his booty before the king could approach him. Edward, however, took care to revenge himself, by conducting his forces into East Anglia, and ravaging it in like manner. He then gave orders to retire; but the Kentish men, greedy of more plunder, staid behind, and took up their quarters at Bury. Here they were assaulted by the Danes; but the Kentishmen made such an obstinate defence, that though their enemies gained the victory, it was bought by the loss of their bravest men, and, among the rest, of the usurper Ethelwald himself.

The king, now freed from the attempts of so dangerous a rival, concluded an advantageous peace with the East Angles. He next set about reducing the Northumbrians; and for this purpose equipped a fleet, hoping that thus they would be induced to remain at home to defend their own country, without attempting to invade his territories. He was disappointed in his expectations. The Northumbrians were more eager to plunder their neighbours than to secure themselves. Imagining that the whole of Edward's forces were embarked on board his fleet, they entered his territories with all the troops they could raise. The king, however, was better prepared for them than they had expected. He attacked them on their return at Tetenhall in the county of Stafford, put them to flight, recovered all the booty, and pursued them with great slaughter into their own country.

The rest of Edward's reign was a scene of continued and successful action against the Northumbrians, East Angles, the Danes of Mercia, and those who came from their native country in order to invade England. He put his kingdom in a good posture of defence, by fortifying the towns of Chester, Eddesbury, Warwick, Cherbury, Buckingham, Towcester, Maldon, Huntingdon, and Colchester. He vanquished Thurketill a Danish chieftain, and obliged him to retire with his followers into France. He subdued the East Anglians, Northumbrians, and several tribes of the Britons; and even obliged the Scots to make submissions. He died in 925, and was succeeded by Athelstan his natural son.

51
Athelstan.

This prince, notwithstanding his illegitimate birth, ascended the throne without much opposition, as the legitimate children of Edward were too young to rule a nation so much liable both to foreign invasions and domestic troubles as England at present was. One Alfred, however, a nobleman of considerable power, entered into a conspiracy against him. It is said, that this nobleman was seized upon strong suspicions, but without any certain proof. He offered to swear to his innocence before the pope; and in those ages it was supposed that none could take a false oath in presence of such a sacred person, without being visited by an immediate judgment from God. Alfred was accordingly conducted to Rome, and took the oath required of him before Pope John. The words were no sooner

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pronounced, than he fell into convulsions, of which he expired in three days. The king, fully convinced of his guilt, confiscated his estate, and made a present of it to the monastery of Malmesbury.

This accident proved the means of establishing the authority of Athelstan in England. But finding the Northumbrians bore the English yoke with impatience, he gave Sithric, a Danish nobleman, the title of king of Northumberland; and in order to secure his friendship, gave him his own sister Editha in marriage. This was productive of bad consequences. Sithric died the year after his marriage with Editha; upon which Anlaf and Godfrid, Sithric's sons by a former marriage, assumed the sovereignty without waiting for Athelstan's consent. They were, however, soon obliged to yield to the superior power of that monarch. The former fled to Ireland; and the latter to Scotland, where he was protected by Constantine king of that country. The Scottish monarch was continually importuned by Athelstan to deliver up his guest, and even threatened with an invasion in case he did not comply. Constantine, detesting this treachery, advised Godfrid to make his escape. He did so, turned pirate, and died soon after. Athelstan, however, resenting this conduct of Constantine, invaded his kingdom, and reduced him, it is said, so low, that he was obliged to make the most humble submissions. This, however, is denied by all the Scottish historians.

Constantine, after the departure of Athelstan, entered into a confederacy with Anlaf, who subsisted by his piracies, and with some of the Welsh princes who were alarmed at the increase of Athelstan's power. All these confederates made an irruption into England at once; but Athelstan meeting them at Brunbury in Northumberland, gave them a total overthrow. Anlaf and Constantine made their escape with difficulty, leaving the greatest part of their men dead on the field of battle. After this period, Athelstan enjoyed his crown in tranquillity. He died in 941, after a reign of 16 years. He passed a remarkable law, for the encouragement of commerce; *viz.* that a merchant, who had made three long sea-voyages on his own account, should be admitted to the rank of athane or gentleman.

52
Defeat of
Canem.es.

Athelstan was succeeded by his brother Edmund. On his accession, he found the kingdom disturbed by the restless Northumbrians, who watched for every opportunity of rising in rebellion. They were, however, soon reduced; and Edmund took care to ensure the peace of the kingdom, by removing the Danes from the towns of Mercia, where they had been allowed to settle, because it was found that they took every opportunity to introduce foreign Danes into the kingdom. He also conquered Cumberland from the Britons. This country, however, he bestowed upon Malcolm king of Scotland, upon condition that he should do homage for it, and protect the north of England from all future incursions of the Danes.

53
Edmund.

Edmund was unfortunately murdered in Gloucester, by one Leolf a notorious robber. This man had been by formerly sentenced to banishment; yet had the boldness to enter the hall where the king himself dined, and to sit at table with his attendants. Edmund immediately ordered him to leave the room. The villain refused to obey; upon which the king leaped upon him,

54
Murdered
by Leolf.

England. him, and seized him by the hair. Leolf then drew a dagger, and gave the king a wound, of which he instantly died, A. D. 946, being the sixth year of his reign.

55
Edred.

As the children of Edmund were too young at the time of his decease, his brother Edred succeeded to the throne. The beginning of his reign, as well as those of his predecessors, was disturbed by the rebellions and incursions of the Northumbrian Danes, who looked upon the succession of every new king to be a favourable opportunity for shaking off the English yoke. On the appearance of Edred with an army, however, they immediately submitted; but before the king withdrew his forces, he laid waste their territories as a punishment for their offence. He was no sooner gone, than they rose in rebellion a second time. They were again subdued; and the king took effectual precautions against their future revolts, by placing English garrisons in all their towns, and appointing an English governor to watch their motions, and suppress their insurrections on the first appearance. In the reign of

56
Sublines the Northumbrians.

57
Celibacy of the clergy introduced.

Edred, celibacy of the clergy began to be preached up under the patronage of St DUNSTON. This man had obtained such an ascendancy over Edred, who was naturally superstitious, that he not only directed him in affairs of conscience, but in the most important matters of state. He was placed at the head of the treasury; and being thus possessed of great power at court, he was enabled to accomplish the most arduous undertakings. He professed himself a partisan of the rigid monastic rules; and having introduced celibacy among the monks of Glastenbury and Abingdon, he endeavoured to render it universal among the clergy throughout the kingdom. The monks in a short time generally embraced the pretended reformation; after which they inveighed bitterly against the vices and luxury of the age. When other topics of defamation were wanting, the marriages of clergymen became a sure object of invective. Their wives received the appellation of *concubines* or some other more opprobrious name. The secular clergy, on the other hand, who were numerous and rich, defended themselves with vigour, and endeavoured to retaliate upon their adversaries. The people were thrown into the most violent ferments; but the monks, being patronised by king Edred, gained ground greatly upon their opponents. Their progress, however, was somewhat retarded by the king's death, which happened in 955, after a reign of nine years. He left children; but as they were infants, his nephew Edwy, son to Edmund, was placed on the throne.

58
Edway.

The new king was not above 16 or 17 years of age at the time of his accession. His reign is only remarkable for the tragical story of his queen Elgiva. She was a princess of the royal blood, with whom Edwy was deeply enamoured. She was his second or third cousin, and therefore within the degrees of affinity prohibited by the canon law. Edwy, however, hearkening only to the dictates of his passion, married her, contrary to the advice of the more dignified ecclesiastics. The monks on this occasion were particularly violent; and therefore Edwy determined not to second their ambitious projects. He soon found reason to repent his having provoked such dangerous enemies. On his coronation day, while his nobility were indulging them-

selves in riotous mirth in a great hall where they had assembled, Edwy withdrew to another apartment to enjoy the company of his beloved queen and her mother. Dunstan guessed the reason of his absence. With unparalleled impudence, he burst into the queen's apartment; and upbraiding Edwy with his lasciviousness, as he termed it, pushed him back to the hall where the nobles were assembled. The king determined to resent such a daring insult. He required from Dunstan an account of his administration of the treasury during the late reign. The monk, probably unable to give a just account, refused to give any; upon which Edwy accused him of malversation in his office, and banished him the kingdom.

This proved the worst step that could possibly have been taken. Dunstan was no sooner gone than the whole nation was in an uproar about his sanctity and the king's impiety. These clamours, as they had been begun by the clergy, so they were kept up and increased by them, till at last they proceeded to the most outrageous violence. Archbishop Odo sent a party of soldiers to the palace. They seized the queen, and burned her face with a red-hot iron, in order to de-⁵⁹stroy her beauty by which she had enticed her husband; queen. after which they carried her by force into Ireland, there to remain in perpetual exile. The king, finding it in vain to resist, was obliged to consent to a divorce from her, which was pronounced by Archbishop Odo. A catastrophe still more dismal awaited Elgiva. She had been cured of her wounds, and had even found means to efface the scars with which her persecutors had hoped to destroy her beauty. She then came to England, with a design to return to the king, whom she still considered as her husband. Unfortunately, however, she was intercepted by a party of soldiers sent for that purpose by the primate. Nothing but her most cruel death could now satisfy that wretch and his accomplices. She was hamstrung at Gloucester, and expired in a few days.

The minds of the English were at this time so much sunk in superstition, that the monstrous inhumanity above mentioned was called a judgment from God upon Edwy and his spouse for their dissolute life, &c. their love to each other. They even proceeded to rebellion against their sovereign; and having raised to the throne Edgar, the younger brother of Edwy, at that time only 13 years of age, they soon put him in possession of Mercia, Northumberland, and East Anglia. Edwy being thus confined to the southern counties, Dunstan returned, and took upon him the government of Edgar and his party; but the death of Edwy soon removed all difficulties, and gave Edgar peaceable possession of the government.

The reign of Edgar proved one of the most fortunate mentioned in the ancient English history. He took the most effectual methods both for preventing tumults at home and invasions from abroad. He quartered a body of disciplined troops in the north, in order to repel the incursions of the Scots, and to keep the Northumbrians in awe. He built a powerful navy; and that he might keep the seamen in the practice of their duty, as well as present a formidable armament to his enemies, he commanded the fleet from time to time, to make the circuit of his dominions.

The

England.

The greatness of king Edgar, which is very much celebrated by the English historians, was owing to the harmony which reigned between him and his subjects; and the reason of this good agreement was, that the king sided with Dunstan and the monks, who had acquired a great ascendancy over the people. He enabled them to accomplish their favourite scheme of dispossessing the secular canons of all the monasteries; and he consulted them not only in ecclesiastical, but also in civil affairs. On these accounts, he is celebrated by the monkish writers with the highest praises; though it is plain, from some of his actions, that he was a man who could be bound neither by the ties of religion nor humanity. He broke into a convent, and carried off by force, and ravished, a nun called *Editha*. His spiritual instructor, Dunstan, for this offence, obliged the king, not to separate from his mistress, but to abstain from wearing his crown for seven years!

61
His licentiousness

Edgar, however, was not to be satisfied with one mistress. He happened once to lodge at the house of a nobleman who had a very beautiful daughter. Edgar, enamoured with desire at the sight of the young lady, without ceremony asked her mother to allow her to pass a night with him. She promised compliance; but secretly ordered a waiting-maid, named *Elfleda*, to steal into the king's bed when the company were gone, and to retire before day-break. Edgar, however, detained her by force, till day-light discovered the deceit. His love was now transferred to the waiting-maid; who became his favourite mistress, and maintained a great ascendancy over him till his marriage with *Elfleda*.

62
His marriage with Elfleda.

The circumstances of this marriage were still more singular and criminal than those above mentioned. *Elfleda* was daughter and heiress to Olgar Earl of Devonshire. She was a person of such exquisite beauty, that her fame was spread all over England, though she had never been at court. Edgar's curiosity was excited by the accounts he had heard of her, and therefore formed a design of marrying her. He communicated his intention to Earl Athelwold his favourite; and ordered him, on some pretence or other, to visit the Earl of Devonshire, and bring him a certain account concerning *Elfleda*. Athelwold went as he was desired; but fell so deeply in love with the lady herself, that he resolved to sacrifice his fidelity to his passion. He returned to Edgar, and told him, that *Elfleda*'s charms were by no means extraordinary, and would have been totally overlooked in a woman of inferior station. After some time, however, turning the conversation again upon *Elfleda*, he told the king that he thought her parentage and fortune made her a very advantageous match; and therefore, if the king gave his consent, he would make proposals to the Earl of Devonshire on his own behalf. Edgar consented, and Athelwold was married to *Elfleda*.—After his marriage, he used his utmost endeavours to keep his wife from court, that Edgar might have no opportunity of observing her beauty. The king, however, was soon informed of the truth; and told Athelwold that he intended to pay him a visit in his castle, and be made acquainted with his new-married wife. The Earl could make no objections; only he desired a few hours to prepare for the visit. He then confessed the whole

to *Elfleda*, and begged of her to appear before the king as much to the disadvantage as possible. Instead of this, she dressed herself to the greatest advantage. Edgar immediately conceived a violent passion for her; and, in order to gratify it, seduced Athelwold into a wood under pretence of hunting, where he stabbed him with his own hand, and afterwards married his widow.

The reign of Edgar is remarkable among historians for the encouragement he gave to foreigners to reside at his court and throughout the kingdom. These foreigners, it is said, corrupted the former simple manners of the nation. Of this simplicity, however, there seems to be no great reason to boast; seeing it could not preserve them from treachery and cruelty, the greatest of all vices: so that their acquaintance with foreigners was certainly an advantage to the people, as it tended to enlarge their views, and cure them of those illiberal prejudices and rustic manners to which islanders are often subject.—Another remarkable incident, is the extirpation of wolves from England. The king took great pleasure in hunting and destroying these animals himself. At last he found that they had all taken shelter in the mountains and forests of Wales. Upon this he changed the tribute imposed upon the Welsh princes by Athelstan, into an annual tribute of 300 wolves heads; and this produced such diligence in hunting them, that the animal has never since appeared in England.

63
Wolves extirpated from England.

Edgar died in 957, after a reign of 16 years. He left a son named *Edward*, whom he had by his first marriage the daughter of Earl Ordmer; and another, named *Ethelred*, by *Elfleda*. The mental qualifications of this lady were by no means answerable to the beauty of her person. She was ambitious, haughty, treacherous, and cruel. The principal nobility, therefore, were greatly averse from the succession of her son *Ethelred*, which would unavoidably throw too much power into the hands of his mother, as he himself was only seven years of age. *Edward*, afterwards furnished the *Martyr*, was therefore pitched upon; and was certainly the most proper person, as he was 15 years of age, and might soon be able to take the government into his own hands. *Elfleda* opposed his advancement with all her might: but Dunstan overcame every obstacle, by anointing and crowning the young prince at Kingston; upon which the whole kingdom submitted without farther opposition.

The only remarkable occurrence in this reign was the complete victory gained by the monks over the secular clergy, who were now totally expelled from the convents. Though this had been pretty nearly accomplished by Edgar, the secular clergy still had partisans in England who made considerable opposition; but these were all silenced by the following miracles. In one synod, Dunstan, finding the majority of votes against him, rose up, and declared that he had that instant received from heaven a revelation in favour of the monks. The whole assembly was so much overawed by this intelligence, that they proceeded no farther in their deliberations. In another synod, a voice issued from the crucifix, acquainting the members, that the establishment of the monks was founded on the will of heaven, and could not be opposed without impiety. But the third miracle was still more alarming. In an-

65
Miracles of St. Dunstan.

England. other synod the floor of the hall sunk, and great numbers of the members were killed or bruised by their fall. It was remarked that Dunstan had that day prevented the king from attending the synod, and that the beam on which his own chair stood was the only one which did not sink. These circumstances, instead of making him suspected as the author of the miracle, were regarded as proofs of the interposition of Providence in his favour.

Edward lived four years after he was raised to the throne, in perfect innocence and simplicity. Being incapable of any treacherous intention himself, he suspected none in others. Though his stepmother had opposed his succession, he had always behaved towards her with the greatest respect; and expressed on all occasions the most tender affection for his brother Ethelred. Being one day hunting in the neighbourhood of the castle where Elfrida resided, he paid her a visit unattended by any of his retinue. After mounting his horse with a design to return, he desired some liquor to be brought him. But while he was holding the cup to his head, a servant of Elfrida stabbed him behind. The king, finding himself wounded, clapped spurs to his horse; but soon becoming faint by the loss of blood, he fell from the saddle, and his foot being entangled in the stirrup, he was dragged along till he expired. His body was found and privately interred at Wreham by his servants. The English had such compassion for this amiable prince, that they belov'd on him the appellation of *Martyr*, and even fancied that miracles were wrought at his tomb. Elfrida built monasteries, and submitted to many penances, in order to atone for her guilt; but, even in that barbarous age, she could never regain the good opinion of the public.

67
Ethelred. After the murder of Edward, his brother Ethelred succeeded to the throne without opposition. As he was a minor when he was raised to the throne, and, even when he came to man's estate, never discovered any vigour or capacity of defending the kingdom against invaders, the Danes began to renew their incursions. Before they durst attempt any thing of importance, however, they first made a small incursion by way of trial. In the year 981, they landed in Southampton from seven vessels; and having ravaged the country, they retired with impunity, carrying a great booty along with them. In 987, they made a similar attempt on the west coast, and were attended with the like success. Finding that matters were now in a favourable situation for their enterprises, they landed in Essex under the command of two chieftains; and, having defeated and killed Brithnot duke of that county, laid waste all the neighbouring provinces. In this extremity, Ethelred, furnished, on account of his preposterous conduct, the *Unready*, bribed the enemy with L. 10,000 to depart the kingdom. This advice was given by Siricius archbishop of Canterbury, and some of the degenerate nobility; and was attended with the success that might have been expected. The Danes appeared next year off the eastern coast. But, in the mean time, the English had determined to assemble at London a fleet capable of repelling the enemy. This failed of success through the treachery of Alfric Duke of Mercia. Having been formerly banished the kingdom, and found great difficulty in getting himself restored to his former dignity, he trusted

thenceforth, not to his services or the affections of his countrymen, but to the influence he had over his vassals, and to the public calamities. These last he determined always to promote as far as he could; because in every revolution his assistance would be necessary, and consequently he must receive a continual accession of power. The English had formed a plan for surrounding and destroying the Danish fleet in the harbour; but Alfric not only gave the enemy notice of this design, but also deferred with his squadron the night before the engagement. The English by this means proved unsuccessful; and Ethelred, in revenge, took Alfgar, Alfric's son, and ordered his eyes to be put out. This piece of cruelty could be productive of no good effect. Alfric had become so powerful, that, notwithstanding his treachery, it was found impossible to deprive him of the government of Mercia.

In 993, the Danes under the command of Sweyn their king, and the Norwegians conducted by Olave king of that country, sailed up the Humber, and destroyed all around them. A powerful army was assembled to oppose these invaders; but through the treachery of the three leaders, all men of Danish extraction, the English were totally defeated. Encouraged by this success, the Danes entered the Thames in 94 vessels, and laid siege to London. The inhabitants, however, made such a brave defence, that the besiegers were finally obliged to give over the attempt. Out of revenge for this disappointment, they laid waste Essex, Suffex, and Hampshire. In these counties they procured horses; by which means they were enabled to penetrate into the more inland parts, and threatened the kingdom with total subjection. Ethelred and his nobles had now recourse to their former expedient. They sent ambassadors to the two northern kings, to whom they promised subsistence and tribute, provided they would, for the present, put an end to their ravages, and soon after depart the kingdom. They agreed to the terms, and peaceably took up their quarters at Southampton. Olave even paid a visit to Ethelred, and received the rite of confirmation from the English bishops. The king also made him many presents; and Olave promised never more to infect the English territories; which promise it is said he afterwards religiously observed.

68
England invaded and ruined by the Danes. After the departure of Olave with his Norwegians, Sweyn, though less scrupulous than the king of Norway, was obliged to leave the kingdom also. But this shameful composition procured only a short relief to the nation. The Danes soon after appeared in the Severn; and having ravaged Wales as well as Cornwall and Devon, they sailed round, and, entering the mouth of the Tamar, completed the ruin of these two counties. Then, returning to the Bristol channel, and penetrating into the country by the Avon, they over-ran all that country, and carried fire and sword even into Dorsetshire. In 993, they changed the seat of war; and, after ravaging the Isle of Wight, they entered the Thames and Midway, where they laid siege to Rochester, and defeated the Kentish men in a great battle. After this victory, the whole province of Kent was made a scene of slaughter and devastation. The extremity of these miseries forced the English into counsels for common defence both by sea and land; but the weakness of the king, the divisions among the nobility, the treachery of some, the cowardice of others,

England.

England the want of concert in all, frustrated every endeavour; and their fleets and armies either came too late to attack the enemy, or were repulsed with dishonour. The English, therefore, devoid both of prudence and unanimity in council, had recourse to the expedient which by experience they had found to be ineffectual. They offered the Danes a large sum if they would conclude a peace and depart the kingdom. These ravagers continually rose in their demands; and now required the payment of £24,000, which the English submitted to give. The departure of the Danes procured them a temporary relief; which they enjoyed as if it was to be perpetual, without making any effectual preparations for giving them a more vigorous reception upon their next return.

69
Marriage of the king with the princess of Normandy.

Besides the receiving this sum, the Danes were at present engaged by another motive to depart from England. They were invited over by their countrymen in Normandy, who at this time were hard pressed by Robert king of France, and who found it difficult to defend their settlements against him. It is probable also, that Ethelred, observing the close connection of all the Danes with one another, however they might be divided in government or situation, was desirous of procuring an alliance with that formidable people. For this purpose, being at present a widower, he made his addresses to Emma, sister to Richard II. Duke of Normandy. He soon succeeded in his negotiations; the princess came over to England, and was married to the king in the year 1001.

Though the Danes had been for a long time established in England, and though the similarity of their language with the Saxon had invited them to an early coalition with the natives; they had as yet found so little example of civilized manners among the English, that they retained all their ancient ferocity, and valued themselves only on their national character of military bravery. The English princes had been so well acquainted with their superiority in this respect, that Athelston and Edgar had been accustomed to keep in pay large bodies of Danish troops, who were quartered about the country, and committed many violences upon the inhabitants. These mercenaries had attained to such an height in luxury, according to the old English writers, that they combed their hair once a-day, bathed themselves once a-week, changed their clothes frequently; and by all these arts of effeminacy, as well as by their military character, had rendered themselves so agreeable to the fair sex, that they debauched the wives and daughters of the English, and had dishonoured many families. But what most provoked the inhabitants was, that, instead of defending them against invaders, they were always ready to betray

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them to the foreign Danes, and to associate themselves with every straggling party which came from that nation.

The animosities between the native English and the Danes manifested themselves among them, had from these causes risen to a great height; when Ethelred, from a policy commonly adopted by weak princes, took the cruel resolution of massacring the Danes throughout the kingdom. On the 13th of November 1002, secret orders were dispatched to commence the execution every where on the same day; and the festival of St Brice, which fell on a Sunday, the day on which the Danes usually bathed themselves, was chosen for this purpose. These cruel orders were executed with the utmost exactness. No distinction was made between the innocent and the guilty; neither sex nor age was spared; nor were the cruel executioners satisfied without the tortures, as well as death, of the unhappy victims. Even Gunilda, sister to the king of Denmark, who had married Ealr Palling, and had embraced Christianity, was, by the advice of Eadric Earl of Wilts, seized and condemned to death by Ethelred, after seeing her husband and children butchered before her face. This unhappy princess foretold, in the agonies of despair, that her murder would soon be avenged by the total ruin of the English nation (A).

The prophecy of Gunilda was exactly fulfilled. In 1003, Sweyn and his Danes, who wanted only a pretence to renew their invasions, appeared off the western coast, and threatened revenge for the slaughter of their countrymen. The English took measures for repulsing the enemy; but these were defeated thro' the treachery first of Alfric; and then of Eadric, a still greater traitor, who had married the king's daughter, and succeeded Alfric in the command of the British armies. The Danes therefore ravaged the whole country. Agriculture was neglected, a famine ensued, and the kingdom was reduced to the utmost degree of misery. At last the infamous expedient of buying a peace was resorted to; and the departure of the Danes was purchased, in 1007, at the expence of £30,000.

The English endeavoured to employ this interval in making preparations against the return of the Danes, which they had reason soon to expect. A law was made, ordering the proprietors of eight hides of land to provide themselves of a horseman and a complete suit of armour; and those of 310 hides to equip a ship for the defence of the kingdom. By this means a formidable armament was raised. There were 243,600 hides in England; consequently the ships equipped must be 785. The cavalry was 30,450 men. All hopes of success from this equipment, however, were disappointed by the factions, animosities, and dissensions

(A) On the subject of this massacre, Mr Hume has the following observations: "Almost all the ancient historians speak of this massacre of the Danes as if it had been universal, and as if every individual of that nation throughout England had been put to death. But the Danes were almost the sole inhabitants in the kingdoms of Northumberland and East Anglia, and were very numerous in Mercia. This representation of the matter was absolutely impossible. Great resistance must have been made, and violent wars ensued; which was not the case. This account given by Wallingford, though he stands single, must be admitted as the only true one. We are told that the name of *lord Dane*, for an idle lazy fellow who lives at other peoples expence, came from the conduct of the Danes who were put to death. But the English princes had been entirely masters for several generations; and only supported a military corps of that nation. It seems probable, therefore, that these Danes only were put to death."

England. tions of the nobility. Edric had caused his brother Brightic to advance an accusation of treason against Wolfnoth governor of Suffex, the father of the famous Earl Godwin; and that nobleman, knowing the power and malice of his enemy, consulted his own safety by deserting with 20 ships to the Danes. Brightic pursued him with a fleet of 80 sail; but his ships being shattered in a tempest, and stranded on the coast, he was suddenly attacked by Wolfnoth, and all his vessels were burnt or otherwise destroyed. The treachery of Edric frustrated every plan of future defence; and the whole navy at last scattered into the several harbours.

72
Ethelred
sle - Nor-
mandy.

By these fatal miscarriages, the enemy had leisure to over-run the whole kingdom. They had now got such a footing, indeed, that they could hardly have been expelled though the nation had been ever so unanimous. But so far did mutual diffidence and dissention prevail, that the governors of one province refused to march to the assistance of another; and were at last terrified from assembling their forces for the defence of their own. At last the usual expedient was tried. A peace was bought with L.48,000; but this did not procure even the usual temporary relief. The Danes, knowing that they were now masters of the kingdom, took the money, and continued their devastations. They levied a new contribution of L.8000 on the county of Kent alone; murdered the archbishop of Canterbury, who had refused to countenance this exaction; and the English nobility submitted every where to the Danish monarch, swearing allegiance to him, and giving hostages for their good behaviour. At last, Ethelred himself, dreading equally the violence of the enemy and the treachery of his own subjects, fled into Normandy, whither he had already sent queen Emma and her two sons Alfred and Edward. The Duke received his unhappy guests with a generosity which does honour to his memory.

73
Returns,
but behaves
as ill as
ever.

The flight of king Ethelred happened in the end of the year 1013. He had not been above six weeks in Normandy, when he heard of the death of Sweyn, which happened at Gainborough before he had time to establish himself in his new dominions. At the same time he received an invitation from the prelates and nobility to resume the kingdom; expressing also their hopes, that, being now better taught by experience, he would avoid those errors which had been so fatal to himself and his people. But the misconduct of Ethelred was incurable; and, on his refusing the government, he behaved in the very same manner that he had done before. His son-in-law Edric, notwithstanding his repeated treasons, retained such influence at court, that he insisted into the king jealousies of Sigefert and Morcar, two of the chief nobles of Mercia. Edric enticed them into his house, where he murdered them; while Ethelred partook of the infamy of this action, by confiscating their estates, and confining the widow of Sigefert in a convent. She was a woman of singular beauty and merit; and in a visit which was paid her, during her confinement, by prince Edmund the king's eldest son, she inspired him with so violent an affection, that he released her from the convent, and soon after married her without his father's consent.

In the mean time, Canute, the son and successor of Sweyn, proved an enemy no less terrible to the English

than his father had been. He ravaged the eastern coast with merciless fury; and put ashore all the English hostages at Sandwich, after having cut off their hands and noses. He was at last obliged, by the necessity of his affairs, to return to Denmark. In a short time, however, he returned, and continued his depredations along the northern coast. He then broke into the counties of Dorset, Wilts, and Somerset; where an army was assembled against him under the command of Prince Edmund and Duke Edric. The latter still continued his peridious machinations; and after endeavouring in vain to get the prince into his power, found means to dissipate the army, and then deserted to Canute with 40 vessels.

Edmund was not disheartened by this treachery. He again assembled his forces, and was in a condition to give the enemy battle. Ethelred, however, had now such frequent experience of the treachery of his subjects, that he had lost all confidence in them. He remained in London, pretending sickness, but in reality from an apprehension that they intended to buy their peace by delivering him into the hands of his enemies. The army called aloud for their sovereign to march at their head against the Danes; and on his refusal to take the field, they were so discouraged, that all the preparations which had been made became ineffectual for the defence of the kingdom. Edmund, deprived of all regular resources for the maintenance of the soldiers, was obliged to commit similar ravages to those practised by the Danes; and after making some fruitless expeditions into the north, which had submitted entirely to Canute's power, he returned to London, where he found every thing in confusion by the death of the king.

Ethelred died in 1016, after an unhappy reign of 35 years; and was succeeded by his eldest son Edmond, furnished *Ironside* on account of his great strength and valour. He possessed abilities sufficient to have saved his country from ruin, had he come sooner to the throne; but it was now too late. He bravely opposed the Danes, however, notwithstanding every disadvantage; till at last the nobility of both nations obliged their kings to come to a compromise, and divide the kingdom between them by treaty. Canute reserved to himself Mercia, East Anglia, and Northumberland, which he had entirely subdued. The southern parts were left to Edmund. This prince survived the treaty only about a month; being murdered at Oxford by two of his chamberlains, accomplices of Edric.

After the death of Edmund, nothing was left for the English but submission to Canute. The least scrupulous of mankind, however, dare not at all times openly commit injustice. Canute, therefore, before he seized the dominions of Edwin and Edward, the two sons of Edmund, suborned some of the nobility to depose, that, in the last treaty with Edmund, it had been verbally agreed, that, in case of Edmund's death, Canute should either be successor to his dominions, or tutor to his children; for historians differ with regard to this particular. This evidence, supported by the great power of Canute, was sufficient to get him elected king of England. Immediately after his accession to the throne, he sent the two sons of Edmund to the court of Sweden, on pretence of being there educated;

England.

74

Ironside di-
vides the
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with the
Danes.

75
Canute.

England.

but charged the king to put them to death as soon as they arrived. The Swedish monarch did not comply with this request; but sent them to Solomon king of Hungary, to be educated in his court. The elder, Edwin, was afterwards married to Solomon's sister; but he dying without issue, that prince gave his sister-in-law, Agatha, daughter of the emperor Henry II. in marriage to Edward, the younger brother; and he bore him Edgar Atheling; Margaret, afterwards queen of Scotland; and Christina, who retired into a convent.

76
Marries
Ethelred's
widow.

Canute was obliged at first to make great concessions to the nobility: but he afterwards put to death many of those in whom he could not put confidence; and, among the rest, the traitor Eadric himself, who was publicly executed, and his body thrown into the Thames. In order to prevent any danger from the Normans, who had threatened him with an invasion, he married Emma the widow of Ethelred, and who now came over from Normandy; promising that he would leave the children he should have by that marriage heirs to the crown after his decease. The English were at first displeased with Emma for marrying the mortal enemy of her former husband; but at the same time were glad to find at court a sovereign to whom they were accustomed, and who had already formed connections with them: and thus Canute, besides securing by his marriage the alliance with Normandy, gradually acquired by the same means the confidence of his own people.

The most remarkable transaction in this prince's reign, besides those mentioned under the article CANUTE, is his expedition to Scotland against Malcolm king of that country, whom he forced to do homage for the county of Cumberland, which the Scots at that time possessed. After this enterprise, Canute passed four years in peace, and died at Shaftsbury; leaving three sons, Sweyn, Harold, and Hardicanute. Sweyn, whom he had by his first marriage with Alfwen, daughter of the earl of Hampshire, was crowned in Norway; Hardicanute, whom Emma had born, was in possession of Denmark; and Harold, who was of the same marriage with Sweyn, was at that time in England.

77
Harold.

Harold succeeded to the crown of England; though it had been stipulated that Emma's son, Hardicanute, should be heir to that kingdom. This advantage Harold obtained by being on the spot, and getting possession of his father's treasures, while Hardicanute was at a distance. As Hardicanute, however, was supported by earl Godwin, a civil war was likely to ensue, when a compromise was made; by which it was agreed, that Harold should enjoy London, and all the provinces north of the Thames, while the possession of the south should remain to Hardicanute: and till that prince should appear and take possession of his dominions, Emma fixed her residence at Winchester, and ruled her son's part. Harold reigned four years; during which time, the only memorable action he performed was a most infamous piece of treachery.—Alfred and Edward, the two sons of Emma by Ethelred, paid a visit to their mother in England. But, in the mean time, earl Godwin being gained over by Harold, a plan was laid for the destruction of the two princes. Alfred was accordingly invited to London by Harold,

78
His treachery and cruelty.

with many professions of friendship; but when he had reached Guildford, he was set upon by Godwin's vassals: about 600 of his train were murdered in the most cruel manner; he himself was taken prisoner, his eyes were put out, and he was conducted to the monastery of Ely, where he died soon after. Edward and Emma, apprised of the fate which awaited them, fled beyond sea, the former into Normandy, the latter into Flanders; while Harold took possession of all his brother's dominions without opposition.—He died in April 1039.

England.

Hardicanute succeeded his brother Harold without opposition. His government was extremely violent and tyrannical. However, it was but of short duration. He died, in 1041, of a debauch at the marriage of a Danish lord. After his death, a favourable opportunity was offered to the English for shaking off the Danish yoke. Sweyn, king of Norway, the eldest son of Canute, was absent; and as the two last kings had died without issue, there appeared none of that race whom the Danes could support as successor to the throne. For this reason, the eyes of the nation were naturally drawn towards prince Edward, who happened to be at court when the king died. There were some reasons, however, to fear, that Edward's succession would be opposed by earl Godwin, who was by far the most powerful nobleman in the kingdom. A declared animosity subsisted between Edward and Godwin, on account of the hand which the latter had in the murder of his brother Alfred; and this wasthought to be an offence of so grievous a nature, that Edward could never forgive it. But here their common friends interposed; and representing the necessity of their good correspondence, obliged them to lay aside their animosities, and to concur in restoring liberty to their native country. Godwin only stipulated that Edward, as a pledge of his sincere reconciliation, should promise to marry his daughter Editha. This proposal was agreed to; Edward was crowned king of England, and married Editha as he had promised. The marriage, however, proved rather a source of discord than otherwise between the king and Godwin. Editha, though a very amiable woman, could never obtain the confidence and affection of her husband. It is even said, that, during the whole course of her life, he abstained from all matrimonial converse with her; and this ridiculous behaviour was highly celebrated by the monkish writers of the age, and contributed to the king's acquiring the title of Saint and Confessor.

79
Edward the
Confessor.

Though the neglect of his daughter could not fail to awaken Godwin's former enmity against king Edward, it was necessary to choose a more popular ground before he could vent his complaints against the king in a public manner. He therefore chose for his theme the influence which the Normans had on the affairs of the government; and a declared opposition took place between him and his favourites. In a short time, this animosity openly broke out with great violence. Eustace count of Bologne having paid a visit to the king, passed by Dover on his return. One of his train being refused access to a lodging which had been appointed for him, attempted to make his way by force, and wounded the master of the house in the contest. The townsmen revenged this insult by the death of the stranger; the count and his train took arms, and

80
variance of the king
and earl
Godwin.
mur-

England.

murdered the townfman in his own houfe. A tumult enfued; near 20 perfons were killed on each fide; and Eufpace being overpowered with numbers, was at laft obliged to fly. He complained to the king; who gave orders to earl Godwin, in whole government Dover lay, to punifh the inhabitants. But this nobleman refufed to obey the command, and endeavoured to throw the whole blame on count Eufpace and his followers. The king was difpleafed; and threatened to make him feel the utmoft effects of his refentment, in cafe he finally refufed to comply. Upon this, Godwin afsembled a powerful army, on pretence of reffreffing fome diforders on the frontiers of Wales; but, inftead of this, marched direftly to Gloucefter, where the king at that time was without any military force, as fufpecting no danger.

81
Godwin
flies to Flanders.

Edward perceiving his danger, applied to Siward duke of Northumberland, and Leofric duke of Mercia, two very powerful noblemen. They haftened to him with fuch followers as they could afsemble, iffuing orders at the fame time for all the forces under their refpective governments to march without delay to the defence of the king. Godwin, in the mean time, fuffered himfelf to be deceived by negotiations, till the king's army became fo powerful, that he was not able to cope with it. He was therefore obliged to fly with his family to Flanders. Here he was protected by Baldwin earl of that country, together with his three fons Gurth, Sweyn, and Tofti; the laft of whom had married Baldwin's daughter. Harold and Leofwin, two other fons of Godwin, took fhelter in Ireland.

82
Returns,
and is re-
conciled with
the king.

After the flight of earl Godwin, he was proceeded againft as a traitor by king Edward. His eftates, and thofe of his fons, were confifcated; his governments given to others; queen Editha was confined in a monaftery; and the great power of this family, which had become formidable to the crown itfelf, feemed to be totally overthrown. Godwin, however, foon found means to retrieve his affairs. Having hired fome fhips, and manned them with his followers, he attempted to make a defcent at Sandwich. The king, informed of his preparations, equipped a fleet which Godwin could not refift, and he therefore retreated into the Flemifh harbours. On his departure, the Englifh difmiffed their armament. This Godwin had expected, and therefore kept himfelf in readinefs for the favourable opportunity. He immediately put to fea, and failed to the ifle of Wight, where he was joined by Harold with a fquadron which he had collected in Ireland. Being thus mafter of the fea, Godwin entered the harbours on the fouthern coaft; feized all the fhips; and being joined by great numbers of his former vaffals, he failed up the Thames, and appeared before London.

The approach of fuch a formidable enemy threw every thing into confufion. The king alone feemed refolute to defend himfelf to the laft extremity; but the interpoftion of many of the nobility, together with the fubmiffions of Godwin himfelf, at laft produced an accommodation. It was ftipulated, that Godwin fhould give hoftages for his good behaviour, and that all the foreigners fhould be banifhed the kingdom; after which, Edward, fenfible that he had not power fufficient to detain the earl's hoftages in England, fent

England.

them over to his kinfman the young duke of Normandy.

83
His fon Harold afpires
to the crown.

Soon after this reconciliation, Godwin died as he was fitting at table with the king. He was fucceeded in the government of Wefsex, Suffex, Kent, and Effex, and in the office of fteward of the houfehold, a place of great power, by his fon Harold. The fon was no lefs ambitious than his father had been; and as he was a man of much greater abilities, he became a more dangerous enemy to Edward than even Godwin had been. Edward knew no better expedient to prevent the increafe of Harold's power, than by giving him a rival. This was Algar fon of Leofric duke of Mercia, whom he invefted with the government of Eaft Anglia, which had formerly belonged to Harold. The latter, however, after fome broils, finally got the better of his rival, and banifhed him the kingdom. Algar returned foon after with an army of Norwegians, with whom he invaded Eaft Anglia; but his death in a fhort time freed Harold from all further apprehenfions from that quarter. His power was ftill further increafed in a fhort time after by the acceffion of his brother Tofti to the government of Northumberland; and Edward now declining in years, and apprehenfive that Harold would attempt to ufurp the crown after his death, refolved to appoint a fucceffor. He therefore fent a deputation into Hungary, to invite over his nephew, Edward, fon to his elder brother, who was the only remaining heir of the Saxon line. That prince accordingly came over with his children, Edgar Atheling, Margaret, and Chriftina; but died a few days after his arrival. His death threw the king into greater perplexity than ever. Being refolved to exclude Harold if poffible, he fecretly caft his eye on his kinfman William duke of Normandy; a perfon of whole power, character, and capacity, he had juftly a very high opinion. This advice had formerly been given him by Robert archbifhop of Canterbury, who was himfelf a Norman, and had been banifhed along with the reft upon the return of earl Godwin. But Edward finding that the Englifh would more eafily acquiefce in the reftoration of the Saxon line, had in the mean time invited his brother's defendants from Hungary as already mentioned. The death of his nephew, and the inexperience and unpromifing qualities of young Edgar, made him refume his former intentions in favour of the duke of Normandy, though his averfion to hazardous enterprifes engaged him to poftpone the execution, and even to keep his purpofe concealed from all his minifters.

Harold in the mean time increafed his popularity by all poffible means, in order to prepare his way for being advanced to the throne after the death of Edward, which now feemed to be faft approaching. He had no fufpicion of the duke of Normandy as a rival; but as he knew that a fone and grandfon of the earl Godwin were in the hands of that prince as hoftages, he feared that they might be made ufe of as checks upon his ambition, in cafe he attempted afterwards to afcend the throne. He therefore prevailed upon Edward to releafe thefe hoftages unconditionally; and having obtained his confent, he fet out for Normandy himfelf, attended by a numerous retinue. He was driven by a tempeft on the territory of Guy count of

England.

Ponthieu, who detained him prisoner, and demanded an exorbitant sum for his ransom: Harold found means to acquaint William with his situation. The duke of Normandy, desirous of gaining Harold over to his party, commanded Guy to restore his prisoner to his liberty. Upon this Harold was immediately put into the hands of the Norman ambassador, who conducted him to Rouen. William received him with great demonstrations of respect and friendship; but soon took an opportunity of acquainting him with his pretensions to the crown of England, and asked his assistance in the execution of his scheme. Harold was surprised with this declaration of the duke; but being entirely in his power, he feigned a compliance with his desires, and promised to second to the utmost of his ability the will of king Edward. William, to secure him as much as possible to his interest, promised him his daughter in marriage, and required him to take an oath that he would fulfil his promises. Harold readily complied; but to make the oath more binding, William privately conveyed under the altar where the oath was taken, reliques of some of the most revered martyrs; and when Harold had taken the oath, he showed him the reliques, and admonished him to observe religiously such a solemn engagement.

Harold was no sooner at liberty, than he found himself master of casuistry sufficient to excuse the breaking of his oath, which had been extorted from him, and which, if kept, might be attended with the subjection of his country to a foreign power. He continued to practise every art to increase his popularity; and about this time, two accidents enabled him to add much to that character which he had already so well established. The Welsh had for some time made incursions into the English territories, and had lately become so troublesome, that Harold thought he could not do a more acceptable piece of service to the public, than undertake an expedition against these invaders. Having therefore prepared some light-armed foot to pursue the natives into their fortresses, some cavalry to secure the open country, and a squadron of ships to attack the sea-coasts, he employed all these forces against the enemy at once; and thus reduced them to such distress, that they were obliged to purchase peace by sending their prince's head to Harold, and submitting to the government of two Welsh noblemen appointed by Edward.

The other incident was no less honourable to Harold. Tostig his brother had been created duke of Northumberland; but being of a violent tyrannical temper, had treated the inhabitants with such cruelty, that they rose in rebellion against him, and drove him from his government. Morcar and Edwin, two brothers, grandsons of the great duke Leofric, joined in the insurrection; and the former being elected duke, advanced with an army to oppose Harold, who had been commissioned by the king to reduce and punish the Northumbrians. Before the armies engaged, Morcar endeavoured to justify his conduct, and represented to Harold, that Tostig had behaved in such a manner, that no one, not even a brother, could defend him without participating of the infamy of his conduct: that the Northumbrians were willing to submit to the king, but required a governor that would pay some attention to their privileges; and they trust-

England.

ed that Harold would not defend in another that violent conduct from which his own government had always kept at so great a distance. This speech was accompanied by such a detail of well-supported facts, that Harold abandoned his brother's cause; and returning to Edward, persuaded him to pardon the Northumbrians, and confirm Morcar in his government. He even married the sister of that nobleman; and by his interest procured Edwin the younger brother to be chosen governor of Mercia. Tostig, in a rage, departed the kingdom, and took shelter in Flanders with Baldwin his father-in-law; while William of Normandy saw that now he had nothing to expect from Harold, who plainly intended to secure the crown for himself.

Edward died in 1067, and was succeeded by Harold with as little opposition as though he had been the lawful heir. The very day after Edward's death, he was anointed and crowned by the archbishop of York. The whole nation seemed joyfully to swear allegiance to him. But he did not long enjoy the crown, to obtain which he had taken so much pains, and which he seemed to have such capacity for wearing. His brother Tostig, provoked at his success, stirred up against him every enemy he could have any influence with. The duke of Normandy also was enraged to the last degree at the perfidy of Harold; but before he commenced hostilities, he sent an embassy to England, upbraiding the king with his breach of faith, and summoning him to resign the kingdom immediately. Harold replied, that the oath, with which he was reproached, had been extorted by the well-grounded fear of violence, and for that reason could never be regarded as obligatory: that he never had any commission either from the late king or the states of England, who alone could dispose of the crown, to make any tender of the succession to the duke of Normandy; and if he, a private person, had assumed so much authority, and had even voluntarily sworn to support the Duke's pretensions, the oath was unlawful, and it was his duty to take the first opportunity of breaking it: that he had obtained the crown by the unanimous suffrages of the people; and should show himself totally unworthy of their favour, did he not strenuously maintain those liberties with which they had entrusted him; and that the Duke, if he made any attempt by force of arms, should experience the power of an united nation, conducted by a prince, who, sensible of the obligations imposed on him by his royal dignity, was determined, that the same moment should put a period to his life and to his government.

This answer was according to William's expectations; and therefore he had already made preparations for invading England. He was encouraged and assisted in this enterprise by Howel count of Brittany, Baldwin earl of Flanders, the emperor Henry IV. and pope Alexander II. The latter declared Harold a perjured usurper; denounced excommunication against him and his adherents; and the more to encourage William in his enterprises, sent him a consecrated banner, and a ring with one of St Peter's hairs in it. Thus he was enabled to assemble a fleet of 3000 vessels, on board of which were embarked 60,000 men, chosen from among those numerous supplies which were sent him from all quarters. Many eminent personages were enlisted under

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Harold succeeded Edward the Confessor.

England, der his banners. The most celebrated were Eustace count of Boulogne, Aimeri de Thouars, Hugh d'Estaples, William d'Evereux, Geoffroy de Rotrou, Roger de Beaumont, William de Warenne, Roger de Montgomeri, Hugh de Grantmesnil, Charles Martel, and Geoffroy Gifford.

85
Defeats the
Danes.

In order to embarras the affairs of Harold the more effectually, William also excited Tofti, in concert with Halfager king of Norway, to assault the English coast. These two having collected a fleet of 350 ships, sailed up the Humber, and disembarked their troops, who began to commit great depredations. They were opposed by Morcar earl or duke (s) of Northumberland, and Edwin earl of Mercia, who were defeated. Harold, on the news of this invasion, assembled a considerable army, engaged the enemy at Stamford, and after a bloody battle entirely defeated them. Tofti and Halfager were killed in the action, and all the fleet fell into the hands of the victors; but Harold generously allowed Olave the son of Halfager to depart with 20 vessels.

The king of England had scarce time to rejoice on account of his victory, when news were brought him that the Normans were landed in Suffex. Harold's victory had considerably weakened his army. He lost many of his bravest officers and soldiers in the action; and he disgusted the rest, by refusing to distribute the Danish spoils among them. He halted, however, by quick marches, to repel this new invader; but though he was reinforced at London and other places with fresh troops, he found himself weakened by the desertion of his old soldiers, who, from fatigue and discontent, secretly withdrew from their colours. Gurth, the brother of Harold, a man of great conduct as well as bravery, became apprehensive of the event; and entreated the king to avoid a general engagement for some time, or at least not to hazard his person. But though this advice was in itself evidently proper, and enforced by all the arguments which Gurth could suggest, Harold continued deaf to every thing that could be said. Accordingly, on the 14th of October 1066, the two armies engaged near Hastings, a town of Suffex. After a most obstinate and bloody battle*, the English were entirely defeated, Harold and his two brothers killed, and William left master of the kingdom of England.

Nothing could exceed the terror of the English upon the news of the defeat and death of Harold. As soon as William passed the Thames at Wallingford, Stigand, the primate, made submissions to him in the name of the clergy; and before he came within sight of London, all the chief nobility, and even Edgar Atheling himself, who, being the rightful heir to the throne, had just before been declared king, came and submitted to the conqueror. William very readily accepted of the crown upon the terms that were offered him; which were, that he should govern according to the established customs of the country. He could indeed have made what terms he pleased; but, though really a conqueror, he chose rather to be thought an elected king. For this reason he was crowned at Westminster by the archbishop of York, and took the oath administered to the former kings of England; namely,

that he would protect and defend the church, observe the laws of the realm, and govern the kingdom with impartiality.

England,

The English historians complain of the most grievous oppression by William and his Normans. Whether by his conduct the conqueror willingly gave the English opportunities of rebelling against him, in order to have a pretence for oppressing them afterwards, is not easy to say; but it is certain that the beginning of his reign cannot justly be blamed. The first disgust against his government was excited among the clergy. William could not avoid the rewarding of those numerous adventurers who had accompanied him in his expedition. He first divided the lands of the English barons who had opposed him among his Norman barons; but as these were found insufficient, he quartered the rest on the rich abbies, of which there were many in the kingdom, until some other opportunity of providing for them offered itself.

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The English
grievously
oppressed.

Though this last step was highly resented by the clergy, it gave very little offence to the laity. The whole nation, however, was soon after disgusted, by seeing all the real power of the kingdom placed in the hands of the Normans. He disarmed the city of London, and other places which appeared most warlike and populous, and quartered Norman soldiers wherever he dreaded an insurrection. This was indeed acting as a conqueror, and not as an elected king; but the event showed the necessity of such precautions. The king having thus secured, as he imagined, England from any danger of a revolt, determined to pay a visit to his Norman dominions. He appointed his brother Odo, bishop of Bayeux, and William Fitz-Osborne, regents in his absence; and to secure himself yet farther, he resolved to carry along with him such of the English nobility as he put the least confidence in.

Having taken all these methods to ensure the tranquillity of his new kingdom, William set sail for Normandy in March 1067; but his absence produced the most fatal consequences. Discontents and murmurings were multiplied everywhere; secret conspiracies were entered into against the government; hostilities were commenced in many places; and every thing seemed to threaten a speedy revolution. William of Poitiers, a Norman historian, throws the blame entirely on the English. He calls them a seditious and mutinous race, while he celebrates with the highest encomiums the justice and lenity of Odo's and Fitz-Osborne's administration. On the other hand, the English historians tell us, that these governors took all opportunities of oppressing the people, either with a view to provoke them to rebellion, or in case they tamely submitted to their impositions, to grow rich by plundering them. Be this as it will, however, a secret conspiracy was formed among the English for a general massacre of the Normans, like what had formerly been made of the Danes. This was prosecuted with so much animosity, that the vassals of the earl of Coxo put him to death because he refused to head them in the enterprise. The conspirators had already taken the resolution, and fixed the day for their intended massacre, which was to be on Ash-Wednesday, during the time of divine service,

vices,

86
Is defeated
and killed
by William
of Norman-
dy.
* See Ha.
singr.

87
William the
Conqueror.

England.

vice, when all the Normans would be unarmed as penitents, according to the discipline of the times. But the presence of William disconcerted all their schemes. Having got intelligence of their bloody purpose, he hastened over to England. Such of the conspirators as had been more open in their rebellion, consulted their safety by flight; and this served to confirm the proofs of an accusation against those who remained. From this time the king not only lost all confidence in his English subjects, but regarded them as inveterate and irreconcilable enemies. He had already raised such a number of fortresses in the country, that he no longer dreaded the tumultuous or transient efforts of a discontented multitude. He determined therefore to treat them as a conquered nation. "The first instance of this treatment was his revival of the tax of Danegelt, which had been imposed by the Danish conquerors, and was very odious to the people. This produced great discontents, and even insurrections. The inhabitants of Exeter and Cornwall revolted; but were soon reduced, and obliged to implore the mercy of the conqueror. A more dangerous rebellion happened in the north; but this was also soon quashed, and the English became sensible that their destruction was intended. Their easy submission after the battle of Hastings had inspired the Normans with contempt; their commotions afterwards had rendered them objects of hatred; and they were now deprived of every expedient which could make them either regarded or beloved by their sovereign. Many fled into foreign countries; and among the rest Edgar Atheling himself, who made his escape to Scotland, and carried thither his two sisters Margaret and Christina. They were well received by Malcolm, who soon after married Margaret the elder sister, and also received great numbers of other exiles with the utmost kindness.

The English, though unable to make any resistance openly, did not fail to gratify their resentment against the Normans in a private manner. Seldom a day passed, but the bodies of assassinated Normans were found in the woods and high-ways, without any possibility of bringing the perpetrators to justice. Thus, at length, the conquerors themselves began again to wish for tranquillity and security; and several of them, though entrusted with great commands, desired to be dismissed the service. In order to prevent these desertions, which William highly resented, he was obliged to allure others to stay by the largeness of his bounties. The consequences were, fresh exactions from the English, and new insurrections on their part against their cruel masters. The Norman power, however, was too well founded to be now removed, and every attempt of the English to regain their liberty served only to rivet their chains the more firmly. The county of Northumberland, which had been most active in these insurrections, now suffered most severely. The whole of it was laid waste, the houses were burned, the instruments of agriculture destroyed, and the inhabitants forced to seek new places of abode. On this occasion it is said that above 100,000 persons perished either by the sword or famine; and the country is supposed, even to this day, to retain the marks of its ancient depopulation. The estates of all the English gentry were next confiscated, and bestowed on the Normans. By this means all the ancient and honourable families were re-

duced to beggary; and the English found themselves totally excluded from every road that led either to honour or preferment.

By proceeding in this manner, William at last broke the spirit of the English nation, and received no farther trouble from them. In 1076, however, he found that the latter part of his life was likely to be unhappy through dissensions in his own family. He had four sons, Robert, Richard, William, and Henry, besides several daughters. Robert, his eldest son, surnamed *Curthose*, from the shortness of his legs, was a prince who inherited all the bravery and ambition of his family. He had formerly been promised by his father the government of the province of Maine in France, and was also declared successor to the dukedom of Normandy. He demanded from his father the fulfilment of these promises; but William gave him a flat denial, observing, that "it was not his custom to throw off his clothes till he went to bed." Robert declared his resentment; and openly expressed his jealousy of his two brothers William and Henry, (for Richard was killed, in hunting, by a stag). An open rupture was soon commenced. The two young princes one day took it into their heads to throw water on their elder brother as he passed through the court after leaving their apartment. Robert construed this frolic into a studied indignity; and having these jealousies still farther inflamed by one of his favourites, he drew his sword, and ran up stairs with an intent to take revenge. The whole castle was quickly filled with tumult, and it was not without some difficulty that the king himself was able to appease it. But he could not allay the animosity which from that moment prevailed in his family. Robert, attended by several of his confederates, withdrew to Rouen that very night, hoping to surprize the castle; but his design was defeated by the governor. The popular character of the prince, however, engaged all the young nobility of Normandy, as well as of Anjou and Brittany, to espouse his quarrel; even his mother is supposed to have supported him in his rebellion by secret remittances. The unnatural contest continued for several years; and William was at last obliged to have recourse to England for support against his own son. Accordingly, he drew an army of Englishmen together; he led them over to Normandy, where he soon compelled Robert and his adherents to quit the field, and was quickly re-instated in all his dominions. Robert then took shelter in the castle of Gerberoy, which the king of France had provided for him, where he was shortly after besieged by his father. As the garrison was strong, and conscious of their treason, they made a gallant defence; and many skirmishes and duels were fought under its walls. In one of these the king and his son happened to meet; but being both concealed by their helmets, they attacked each other with mutual fury. The young prince wounded his father in the arm, and threw him from his horse. The next blow would probably have put an end to his life, had he not called for assistance. Robert instantly recollected his father's voice, leaped from his horse, and raised him from the ground. He prostrated himself in his presence, asked pardon for his offences, and promised for the future a strict adherence to his duty. The king was not so easily appeased; and perhaps his resentment was heightened

England.

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Dissensions
in William's
family.

England. by the disgrace of being overcome. He therefore gave his malediction to his son; and returned to his own camp on Robert's horse, which he had affixed him to mount. After some recollection, however, he was reconciled to Robert, and carried him with him into England.

William returned in 1081; and being now freed from his enemies both at home and abroad, began to have more leisure to attend to his own domestic affairs. For this purpose the *Doomsday-Book* was composed by his order, of which an account is given under that article. He reserved a very ample revenue for the crown; and in the general distribution of land among his followers, kept possession of no fewer than 1400 manors in different parts of the country. No king of England was ever so opulent; none was able to support the splendor and magnificence of a court to such a degree; none had so many places of trust and profit to bestow; and consequently none ever had such implicit obedience paid to his commands. He delighted greatly in hunting; and to indulge himself in this with the greater freedom, he depopulated the county of Hampshire for 30 miles, turning out the inhabitants, destroying all the villages, and making the wretched outcasts no compensation for such an injury. In the time of the Saxon kings, all noblemen without distinction had a right to hunt in the royal forests; but William appropriated all these to himself, and published very severe laws to prohibit his subjects from encroaching on this part of his prerogative. The killing of a boar, a deer, or even an hare, was punished with the loss of the delinquent's eyes; at the time when the killing of a man might be atoned for by paying a moderate fine or composition.

As the king's wealth and power were so great, it may reasonably be supposed, that the riches of his ministers were in proportion. Odo, bishop of Bayeux, William's brother, was become so rich, that he resolved to purchase the papacy. For this purpose, taking the opportunity of the king's absence, he equipped a vessel in the Isle of Wight, on board of which he sent immense treasures, and prepared for his embarkation. He was detained, however, by contrary winds; and, in the mean time, William, being informed of his designs, resolved to prevent the exportation of so much wealth from his dominions. Returning therefore from Normandy, where he was at that time, he came to England the very instant his brother was stepping on board. He immediately ordered him to be made prisoner: but his attendants, respecting the bishop's ecclesiastical character, scrupled to execute his commands; so that the king was obliged to seize him with his own hand. Odo appealed to the Pope: but the king replied, that he did not seize him as bishop of Bayeux, but as earl of Kent; and, in that capacity, he expected, and would have, an account of his administration. He was therefore sent prisoner to Normandy; and, notwithstanding all the remonstrances and threats of pope Gregory, was detained in custody during the remainder of William's reign.

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Death of the queen; Soon after this, William felt a severe blow in the death of Matilda his queen; and, almost at the same time, received information of a general insurrection in Maine, the nobility of which had always been averse to his government. Upon his arrival on the continent, he

found that the insurgents had been secretly assisted and excited by the king of France, who took all opportunities of lessening the Norman power, by creating dissensions among the nobles. His displeasure on this account was very much increased, by notice he received of some railleries thrown out against him by the French monarch. It seems that William, who was become corpulent, had been detained in bed some time by sickness; and Philip was heard to say, that he only lay in of a big belly. This provoked the English monarch, that he sent him word, he would soon be up, and would, at his churching, present such a number of tapers as would fet the kingdom of France in a flame.

To perform this promise, he levied a powerful army; and, entering the Isle of France, destroyed every thing with fire and sword. He took the town of Mante, and reduced it to ashes. But a period was soon put to the conquests and to the life of this great warrior by an accident. His horse happening to put his fore-foot on some hot ashes, plunged so violently, that the rider And of the king. was thrown forward, and bruised his belly on the pommel of the saddle. Being now in a bad habit of body, as well as somewhat advanced in years, he began to be apprehensive of the consequences, and ordered himself to be carried in a litter to the monastery of St Gervais. Finding his illness increase, and being sensible of the approach of death, he discovered at last the vanity of all human grandeur; and was struck with remorse for those many cruelties and violences of which he had been guilty. He endeavoured to make compensation by presents to churches and monasteries, and gave orders for the liberation of several English noblemen. He was even prevailed upon, though not without reluctance, to release his brother Odo, against whom he was very much incensed. He left Normandy and Maine to his eldest son Robert. He wrote to Lanfranc the primate of England, desiring him to crown William king of England. To Henry he bequeathed nothing but the possessions of his mother Matilda; but foretold, that one day he would surpass both his brothers in power and opulence. He expired on the 9th September 1087, in the 63d year of his age, in the 21st of his reign over England, and 54th of that over Normandy.

92
William Rufus. William, surnamed *Rufus*, from his red hair, was in Normandy at the time of his father's illness. He no sooner received the letter for Lanfranc, than, leaving his father in the agonies of death, he set out for England; where he arrived before intelligence of the decease of the Conqueror had reached that kingdom. Being sensible that his brother Robert, as being the eldest son, had a preferable title to himself, he used the utmost dispatch in getting himself firmly established on the throne. The English were so effectually subdued, that they made no opposition; but the Norman barons were attached to Robert. This prince was brave, open, sincere, and generous; and even his predominant fault of indolence was not disfigurable to those haughty barons, who affected an almost total independence of their sovereign. The king, on the other hand, was violent, haughty, and tyrannical. A powerful conspiracy was therefore carried on against William; and Odo, bishop of Bayeux, undertook to conduct it. Many of the most powerful nobility were concerned; and

England.

as the conspirators expected to be in a short time supported by powerful succours from Normandy, they retired to their castles, and put themselves in an offensive posture.

William, sensible of his danger, engaged the English on his side, by promising some mitigation of their hardships, and liberty to hunt in the royal forests. Robert, in the mean time, through his natural indolence, neglected to give his allies proper assistance. The conspirators were obliged to submit. Some of them were pardoned; but most of them confiscated, and their estates bestowed on the barons who had continued faithful to the king.

93
Proves a
tyrant.

William, freed from this danger, thought no more of his promises to the English. He proved a greater tyrant than his father; and, after the death of Lanfranc, who had been his preceptor, and kept him within some bounds, he gave full scope to his violent and rapacious disposition. Not content with oppressing the laity, he invaded the privileges of the church; which, in those days, were held most sacred. He seized the temporalities of all the vacant bishoprics and abbays, and openly put to sale those fees and abbays which he thought proper to dispose of.

94
Attains
the con-
quest of
Normandy.

These proceedings occasioned great murmurs among the ecclesiastics, which were quickly spread through the nation, but the terror of William's authority preserved the public tranquillity. In 1066, the king thought himself strong enough to attempt the conquest of Normandy, which at that time was in the greatest confusion through the indolent and negligent administration of Robert. Several of the barons had revolted, and these revolts were encouraged by the king of France. Robert also imagined he had reason to fear the intrigues of his other brother Henry, whom for 3000 merks he had put in possession of *Cotentin*, near a third part of the duchy of Normandy. He therefore threw him into prison; but finding himself threatened with an invasion from the king of England, he gave Henry his liberty, and even made use of his assistance in suppressing the insurrections of his rebellious subjects. William, however, was no sooner landed in Normandy, than the nobility on both sides interposed, and a treaty of peace was concluded. In this treaty Henry finding his interests entirely neglected, retired to *St Michael's Mount*, a strong fortress on the coast of Normandy, and infested the neighbourhood with his incursions. He was besieged by his two brothers, and obliged to capitulate in a short time; after which, being deprived of all his dominions, he wandered about for some time with a few attendants, and often in great poverty.

The peace with Robert was of no long duration. In the interval some hostilities with Scotland succeeded, and these terminated in the death of Malcolm king of that country; after which new broils ensued with Normandy. The rapacious temper of William prompted him to encroach upon his brother's territories, and the same rapacity prompted him to use a very extraordinary expedient in order to accomplish his designs. Having gone over to Normandy to support his partisans, he ordered an army of 20,000 men to be raised in England, and conducted to the sea-coast as if they were to be immediately embarked: but when they came there, instead of embarking, they were forced to pay the king ten shillings a man; after which they were dismissed to their several

No 116.

England.

counties. With this money William engaged the king of France to depart from the protection of Robert; and also bribed many of the Norman barons to revolt. He was called from Normandy, however, by an irruption of the Welsh; and having repulsed them, he was prevented from attempting other enterprises by a conspiracy of his barons.

In 1096, however, the superstition of Robert put the king of England in possession of those dominions ⁹⁵ *Purchases the duchy* which he had not been able to conquer by force of arms. The crusades were now commenced, and Robert was desirous of undertaking an expedition into the Holy Land. As money for this purpose was wanting, he mortgaged his dominions to his brother for 10,000 merks. The king raised the money by violent extortions on his subjects; forcing even the convents to melt their plate, in order to furnish the quota demanded of them. He was then put in possession of Normandy and Maine; and Robert with a magnificent train set out for the Holy Land.

After the death of Lanfranc, the king had retained in his own hands the revenues of Canterbury, as he had done those of many other bishoprics; but falling into a dangerous illness, he was seized with remorse; and the clergy represented to him that he was in danger of eternal perdition if he did not make atonement for those impieties and sacrifices of which he had been guilty. He therefore instantly resolved to supply the vacancy of Canterbury: he sent for Anselm, a Piedmontese by birth, abbot of Bee in Normandy, who was much celebrated for his piety and devotion. The abbot refused the dignity with great earnestness; fell on his knees, wept, and intreated the king to change his purpose; and when he found him obstinate in forcing the pastoral staff upon him, he kept his fist so hard clenched, that it required the utmost violence of the bystanders to open it, and force him to receive that ensign of his spiritual dignity. William soon after recovered his health, and with it his violence and rapacity. As he now spared the church no more than before, a quarrel with Anselm soon ensued; and this was the more dangerous to the king, on account of the great character for piety which the primate had acquired by his zeal against abuses of all kinds, particularly those of dress and ornament.

96
His quarrel
with the
primate.

At this time there was a mode which prevailed not only in England, but throughout Europe, both among men and women, of giving an enormous length to their shoes, drawing the toe to a sharp point, and affixing to it the figure of a bird's bill, or some such ornament, which was turned upwards, and which was often sustained by gold or silver chains tied to the knee. The ecclesiastics took exception at this ornament, which they said was an attempt to bely the scripture, where it is affirmed, that no man can add a cubit to his stature; and they not only declaimed against it with vehemence, but assembled some synods, in which the fashion was absolutely condemned. Such, however, are the contradictions in human nature, that all the influence of the clergy, which at that time was sufficient to send vast multitudes of people into Asia to butcher one another, was not able to prevail against those long-pointed shoes. The fashion, contrary to what hath happened to almost all others, maintained its ground for several centuries; and even Anselm found his en-

deavours

England. deavours against it ineffectual. He was more successful in decrying the long hair and curled locks then worn by the courtiers. He refused the ashes on Ash-Wednesday to such as were so accoutred; and his authority and eloquence had such influence, that the young men universally abandoned that ornament, and appeared in the crop hair recommended to them by the sermons of the primate. For this reformation Anselm is highly celebrated by his historian Eadmer, who was also his companion and secretary.

When William's profaneities returned with his health, he was engaged in almost perpetual contests with this austere prelate *. These were pretty well settled, when the king, who had undertaken an expedition into Wales, required Anselm to furnish him with a certain number of soldiers. The primate regarded this as an invasion of the rights of the church; and therefore, tho' he durst not refuse compliance, sent the men so miserably accoutred, that the king was exceedingly displeased, and threatened him with a prosecution. Anselm demanded restitution of all his revenues which the king had seized, and appealed to the Pope. The quarrel, however, ran so high that the primate found it dangerous to remain in England. He desired and obtained the king's permission to retire beyond sea. His temporalities were confiscated immediately on his departure; but pope Urban received him as a martyr in the cause of religion, and even threatened the king with sentence of excommunication. William, however, proceeded in his projects of ambition and violence, without regarding the threats of the Pope; who he knew was at that time too much engaged with the crusades to mind any other business. Though his acquisition of Maine and Normandy had brought him into perpetual contests with the haughty and turbulent barons who inhabited those countries, and raised endless tumults and insurrections; yet William seemed still intent on extending his dominions either by purchase or conquest. William Earl of Poitiers and Duke of Guienne had resolved upon an expedition to the Holy Land; and, for this purpose, had put himself at the head of a vast multitude, consisting, according to some historians, of 60,000 horse, and a much greater number of foot. Like Robert of Normandy, he offered to mortgage his dominions for money sufficient to conduct this multitude into Asia. The king accepted his offer; and had prepared a fleet and army to take possession of these dominions, when an unfortunate accident put an end to his projects and his life. He was engaged in hunting, the sole amusement, and indeed the principal occupation, of princes in those rude times. Walter Tyrrel, a French gentleman remarkable for his skill in archery, attended him in this recreation, of which the new forest was the scene. William had dismounted after a chase; and Tyrrel, impatient to show his dexterity, let fly an arrow at a stag which suddenly started before him. The arrow glanced from a tree, and struck the king to the heart. He instantly fell down dead; and Tyrrel, terrified at the accident, clapt spurs to his horse, hastened to the sea-shore, and embarked for France, where he joined the crusade that was setting out from that country. This happened on the 2d of August 1100, after the king had reigned 13 years, and lived about 40. His body was found in

the woods by the country-people, and buried without ceremony at Winchester.

After the death of William, the crown of right devolved to Robert his eldest brother; for William had no legitimate children. But what Robert had formerly lost by his indolence, he was again deprived of by his absence at the holy war. Prince Henry was in the forest with William Rufus at the time the latter was killed. He no sooner heard the important news, ⁹⁹ Prince Henry u- than he hurried to Winchester, and secured the royal treasure. William de Breteuil, keeper of the treasure, arrived almost the same instant, and opposed his pretensions; telling him, that the treasure belonged to his elder brother, who was now his sovereign, and for whom he was determined to keep it. But Henry, drawing his sword, threatened him with instant death if he dared to disobey him; and others of the late king's retinue, who came every moment to Winchester, joining the prince's party, he was obliged to desist. Henry lost no time in fully accomplishing his purpose. In less than three days he got himself crowned king of England by Maurice bishop of London. Present possession supplied every deficiency of title; and no one dared to appear in defence of the absent prince.

The beginning of king Henry's reign promised to be favourable to the English liberty; owing chiefly to his fear of his brother. To conciliate the affections of his subjects, he passed a charter calculated to remove many of the grievous oppressions which had been complained of during the reigns of his father and brother. He promised, that at the death of any abbot or bishop, he never would seize the revenues of the see or abbey during the vacancy, but would leave the whole to be reaped by the successor; and that he would never let to farm any ecclesiastical benefice, or dispose of it for money. To the laity he promised, that, upon the death of any earl, baron, or military tenant, his heir should be admitted to the possession of his estate, on paying a just and lawful relief; without being exposed to those enormous exactions which had been formerly required. He remitted the wardship of minors; and allowed guardians to be appointed, who should be answerable for the trust. He promised not to dispose of any heiress in marriage but by advice of all the barons; and if any baron intended to give his daughter, sister, niece, or kinswoman, in marriage, it should only be necessary for him to consult the king, who promised to take no money for his consent, nor ever to refuse permission, unless the person to whom it was proposed to marry her should happen to be his enemy. He granted his barons and military tenants the power of bequeathing by will their money or personal estates; and if they neglected to make a will, he promised that their heirs should succeed to them. He renounced the right of imposing moneyage, and of levying taxes at pleasure, on the farms which the barons kept in their own hands. He made some general professions of moderating fines; he offered a pardon for all offences; and remitted all debts due to the crown. He also required, that the vassals of the barons should enjoy the same privileges which he granted to his own barons; and he promised a general confirmation and observance of the laws of king Edward *. * See Frodo. To give greater authenticity to these concessions, a

Sec. An.
film.

97
Who leaves
the king-
dom.

98
Death of
the king.

100
His charter
in favour of
the people.

England. copy of the charter was lodged in some abbey of each county.

101
Quarrels
with the
primates.

† See Pen-
dal Tenure.

King Henry, farther to increase his popularity, degraded and committed to prison Ralph Flambard bishop of Durlam, who had been the chief instrument of oppression under his brother. He sent for Anselm, who was then at Lyons, inviting him to return and take possession of his dignities. Anselm returned; but when Henry proposed to him to do the same homage to him which he had done to his brother, the king met with an absolute refusal. During his exile, Anselm had assisted at the council of Bari; where, besides fixing the controversy between the Greek and Latin churches concerning the procession of the Holy Ghost, the right of election to church-preferments was declared to belong to the clergy alone, and spiritual censures were denounced against all ecclesiastics who did homage to laymen for their fees and benefices, and on all laymen who exacted it. The rite of homage † by the feudal customs was, that the vassal should throw himself on his knees, put his joined hands between those of his superior, and should in that posture swear fealty to him. But the council declared it execrable, that pure hands, which could create God, and offer him up for the salvation of mankind, should be put, after this humiliating manner, between profane hands, which, besides being inured to rapine and bloodshed, were employed day and night in impure purposes and obscene contacts. To this decree therefore Anselm appealed; and declared, that so far from doing homage for his spiritual dignity, he would not even communicate with any ecclesiastic who paid that submission, or who accepted of investitures from laymen. Henry durst not insist; and therefore desired that the controversy might be suspended, and that messengers might be sent to Rome to accommodate matters with the Pope, and to obtain his confirmation of the laws and customs of England.

Henry now took another step which seemed capable of confirming his claims to the crown without any danger of a rival. The English remembered with regret their Saxon monarchs, when they compared the liberty they enjoyed under them with the tyranny of the Normans. Some descendants of that favourite line still remained; and among the rest, Matilda, the piece of Edgar Atheling. Upon her the king fixed his eyes as a proper consort, by whose means the breach between the Saxons and Normans might be cemented. A difficulty, however, occurred, because she had been educated in a nunnery. The affair was examined by Anselm in a council of prelates and nobles summoned at Lambeth. Matilda there proved, that she had put on the veil, not with a design of entering into a religious life, but merely in imitation of a custom familiar to the English ladies, who protected their chastity from the brutal violence of the Normans by taking shelter under that habit, which amid the horrid licentiousness of the times was yet generally revered. The council, sensible that even a princess had otherwise no security for her honour, admitted this reason as valid. They pronounced that Matilda was still free to marry; and her nuptials with Henry were celebrated by Anselm with great solemnity and pomp.

102
He marries
Matilda.

While Henry was thus rendering himself popular at home, his brother Robert, who had loitered away a

twelvemonth in Italy, where he married Sibylla daughter of the count of Conversana, arrived in England, in 1101, in order to put in his late and ineffectual claim to the crown. His fame, however, on account of the exploits he had performed in Palestine, was so great, that even yet he was joined by many noblemen of the first rank, and the whole nation seemed prepossessed in his favour. But Henry, having paid his court to Anselm, by his means retained the army in his interests, and marched with them to Portsmouth, where Robert had landed his forces a few days before. The armies lay for some time in sight of each other; when an accommodation was effected through the mediation of Anselm and other great men. By this treaty it was agreed, that Robert should resign his pretensions to England, and receive in lieu of them an annual pension of 3000 marks; that if either of the princes died without issue, the other should succeed to his dominions; that the adherents of each should be pardoned, and restored to all their possessions either in Normandy or England; and that neither Robert nor Henry should thenceforth encourage, receive, or protect, the enemies of each other.

The two princes separated with mutual marks of friendship; but next year, Henry, under various pretences confiscated the estates of almost all the noblemen who had favoured his brother's pretensions. Robert, enraged at the fate of his friends, ventured to come to England in order to remonstrate with his brother in person. But he met with such a bad reception, that, apprehending his liberty to be in danger, he was glad to make his escape by resigning his pension.

This infringement of the treaty was followed the ensuing year by an invasion of Normandy, at the desire of Robert's own subjects, whom he was totally incapable of governing *. The event of this war was the * See Normandy. defeat and captivity of Robert, who was henceforth deprived not only of all his dominions, but of his personal liberty. He lived 28 years a prisoner, and died in the castle of Cardiff in Glamorganshire. It is even said by some, that he was deprived of his sight by a red-hot copper-bason applied to his eyes, and that King Henry appealed his conscience by founding the monastery of Reading.

The conquest of Normandy was completed in 1063; and next year the controversy between the king and prime, concerning the investitures of clergymen and their doing homage to princes, was resumed. The king was very sensible that it was not his interest to quarrel with such a powerful body as the clergy were at that time; and on the other hand he fully understood the necessity of guarding the prerogatives of the crown from their encroachments. While, therefore, he avoided an open rupture with Anselm, he obliquely refused to give up the privileges which had been enjoyed by his predecessors. On the first arrival of Anselm, the king had avoided the dispute in the manner already mentioned. A messenger was dispatched to Rome, in order to compromise matters with the Pope. The messenger returned with an absolute refusal of the king's demands. One of the reasons given by the Pope on this occasion, was expressed in the following words: "It is monstrous that a son should pretend to beget his father, or a man to create his God: priests are called

104
Normandy
invaded by
Henry.

* See Nor-
mandy.

105
Quarrel
with the
primate.

England.
101
Crown of
England
claimed by
Robert.

England.

called *gods* in scripture, as being the vicars of God: and will you, by your abominable pretensions to grant them their investiture, assume the right of creating them?" Henry was not yet convinced; but as he was determined to avoid, or at least to delay, the coming to any dangerous extremity with the church, he persuaded Anselm, that by farther negotiation he should be able to compound matters with the Pope. Messengers were therefore dispatched to Rome a second time from the king; and also from Anselm, who wanted to be fully assured of the Pope's intentions. They returned with letters wrote in the most arrogant and positive manner, both to the king and primate. The king suppressed the letter sent to himself; and persuaded the three bishops, by whom it was sent, to assert, upon their episcopal faith, that the Pope had assured them of his private good intentions towards king Henry, and of his resolution not to resent any future exertion of his prerogative in granting investitures; though he himself scrupled to give this assurance under his hand, lest other princes should copy the example and assume a like privilege. Anselm's two messengers, who were monks, affirmed that it was impossible this story could have any foundation; but their word was not deemed equivalent to that of three bishops; and the king, as if he had finally gained his cause, proceeded to fill the sees of Hereford and Salisbury, and to invest the new bishops in the usual manner. Anselm, however, gave no credit to the assertions of the king's messengers; and therefore refused not only to consecrate them, but even to communicate with them; and the bishops themselves, finding they were become universally odious, returned the ensigns of their spiritual dignity.

The quarrel continued between the king and primate, till the latter, sensible of his dangerous situation, desired leave to make a journey to Rome, in order to lay the case before the Pope. This permission was easily obtained; but no sooner was the primate gone, than Henry confiscated all his revenues, and sent another messenger to negotiate with the Pope. The new messenger told his holiness, that his master would sooner part with his crown than the right of granting investitures. "And I (replied the Pope) would rather lose my head than allow him to retain it." This quarrel now became very dangerous to the king; as he was threatened by the Pope with excommunication, which would have been attended with terrible consequences. At last, however, a compromise was made in the following manner. Before bishops took possession of their dignities, they had formerly been accustomed to pass through two ceremonies: They received, from the hands of the sovereign, a ring and cross as the symbols of their office, and this was called their *investiture*: they also made those submissions to the prince, which were required of the vassals by the rites of the feudal law, and which received the name of *homage*. The Pope, therefore, was for the present contented with Henry's resigning his right of granting investitures, by which the spiritual dignity was supposed to be conferred; and he allowed the bishops to do homage for their temporal properties and privileges. After this, the Pope allowed Anselm to communicate with the prelates who had already received investitures from the crown; and he only required of them some

England.

submissions for their past conduct. He also granted to Anselm a plenary power of remedying every disorder, which he said might arise from the barbarousness of the country. About the same time the marriage of priests was prohibited; and even laymen were not allowed to marry within the seventh degree of affinity. By this contrivance the Pope augmented the profits which he reaped from granting dispensations, and likewise those from divorces. For as the art of writing was then rare, and parish-registers were not regularly kept, it was not easy to ascertain the degrees of affinity even among people of rank; and any man who had money to pay for it, might obtain a divorce, on pretence that his wife was more nearly related to him than was permitted by the canons. A decree was also published, prohibiting the clergy to wear long hair; and the king, tho' he would not resign his prerogatives to the church, very willingly cut his hair in the form which was required of him, obliging all the courtiers at the same time to follow his example.

From the time of this compromise, which happened in 1107, to the year 1120, nothing remarkable happened except some slight commotions in Normandy; but this year, prince William, the king's only son, was unfortunately drowned off the coast of Normandy; and Henry was so much affected, that he is said never afterwards to have smiled or recovered his wonted cheerfulness. It is very doubtful, however, whether the death of this prince was not an advantage to the British nation, since he was often heard to express the utmost hatred to the natives; inasmuch that he had threatened, that when he came to the throne, he would make them draw the plough, and would turn them into beasts of burden. These prepossessions he inherited from his father; who, though he was wont, when it might serve his purposes, to value himself on his birth as a native of England, showed, in the course of his government, an extreme prejudice against that people. All hopes of preferment to ecclesiastical as well as civil dignities are denied to the English during this whole reign; and any foreigner, however ignorant or worthless, was sure to have the preference in every competition. The charter formerly mentioned, which the king granted at the beginning of his reign, was no more thought of; and the whole fell so much into neglect and oblivion, that in the following century, when the barons, who had heard an obscure tradition of it, desired to make it the model of the great charter which they exacted from king John, they could only find one copy of it in the whole kingdom; while the grievances, proposed to be redressed by it, continued still in their full extent.

As Henry had now no legitimate children except Matilda, whom in 1110 he had betrothed, though only eight years of age, to the emperor of Germany, he was induced to marry a second time in hopes of having sons. He made his address accordingly to Adelaïs the daughter of Godfrey Duke of Lovaine, and niece to Pope Calixtus; a young princess of an amiable person. But Adelaïs brought him no children: and in 1135, the king died in Normandy, from eating too plentifully of lampreys; having lived 67 years, and reigned 35.

By the will of king Henry; his daughter Matilda became heiress of all his dominions. She had been

106
ance
William
drowned.

107
Death of
King Henr.
ry.

England.

married, after her first husband's death, to Geoffrey Plantagenet eldest son of the count of Anjou, by whom she had a son named *Henry*; but as Geoffrey had given umbrage to the king of England in several instances, no notice was taken of him in the will. The nobility had already sworn fealty to her; and the foremost to show this mark of submission to the king's will had been Stephen, son of the count of Blois (who had married Adela the daughter of William the Conqueror). He had been married to Matilda daughter and heiress of Eustace Count of Boulogne; who brought him, besides that feudal sovereignty of France, a vast property in England, which in the distribution of lands had been conferred by the Conqueror on the family of Boulogne. By this marriage Stephen acquired a new connection with the royal family of England: for Mary, his wife's mother, was sister to David the present king of Scotland, and to Matilda the first wife of Henry and mother of the empress. The king also, imagining that by the aggrandizement of Stephen he strengthened the interest of his own family, had enriched him with many possessions; but instead of this, it appeared by the event that he had only put it more and more in his power to usurp the throne.

To S
Stephen us-
urps the
throne.

No sooner was Henry dead, than Stephen hastened from Normandy into England. The citizens of Dover and Canterbury, apprized of his purpose, shut their gates against him; but when he arrived at London, some of the lower class of people, incited by his emissaries, immediately proclaimed him king. The archbishop of Canterbury refused to give him the royal unction; but this difficulty was got over by Stephen's brother the bishop of Winchester. Hugh Bigod, steward of the household, made oath before the prime, that the late king, on his death-bed, had discovered a dissatisfaction with his daughter Matilda, and had expressed his intention of leaving the Count of Boulogne heir to all his dominions; and the bishop, either believing, or pretending to believe, this testimony, gave Stephen the royal unction. Very few of the nobility attended his coronation; but none opposed his usurpation, however unjust or flagrant.

Stephen, in order to establish himself on the throne as firmly as possible, passed a charter, in which he made liberal promises to all ranks of men. To the clergy he promised, that he would speedily fill all the vacant benefices, and never would levy any of the rents during the vacancy. To the nobility he gave liberty to hunt in their own forests; and to the people he promised to remit the tax of danegelt, and to restore the laws of Edward the Confessor. He seized the king's treasure at Winchester, amounting to £. 100,000; with part of which money he hired mercenary soldiers from the continent; and with another part procured a bull from the Pope, confirming his title to the English throne.

Matilda, in the mean time, endeavoured to recover her just rights of which Stephen had deprived her; but for some time she met with no success either in England or Normandy. Her husband Geoffrey himself was obliged to conclude a peace with Stephen, on condition of the king's paying him during that time an annual pension of £. 5000.

Robert Earl of Gloucester was the first who shook the power of Stephen. He was natural son to the late

king; a man of great honour and ability, and was very much attached to the interests of Matilda. When Stephen usurped the throne, he offered to do him homage, and take the oath of fealty; but with an express condition, that the king should maintain all his stipulations, and never invade any of Robert's rights or dignities. With this condition Stephen was obliged to comply, on account of the great power of that nobleman, though he knew that it was meant only to afford him a favourable opportunity of revelling when occasion served. The clergy imitated Robert's example; and annexed to their oath of allegiance the following condition, namely, that they were only bound as long as the king defended the ecclesiastical liberties, and supported the discipline of the church. The barons, in return for their submission, exacted terms of still more pernicious tendency. Many of them required to have the right of fortifying their castles, and putting themselves in a posture of defence; and with this exorbitant demand the king was forced to comply. All England was immediately filled with these fortresses; which the noblemen garrisoned either with their vassals, or with licentious soldiers, who flocked to them from all quarters. The whole kingdom now became a scene of rapine and devastation. Wars were carried on by the nobles in every quarter; the barons even assumed the right of coining money, and of exercising, without appeal, every act of jurisdiction; and the inferior gentry, as well as the people, finding no defence from the laws, during this total dissolution of sovereign authority, were obliged, for their immediate safety, to pay court to some neighbouring chieftain, and to purchase his protection, both by submitting to his exactions, and by assisting him in his rapine upon others.

To S
Distracted
state of the
kingdom.

In 1137, the Earl of Gloucester having projected an insurrection, retired beyond sea, sent the king a defiance, and solemnly renounced his allegiance. The next year David king of Scotland appeared with an army in defence of his niece's title; and penetrating into Yorkshire, committed the greatest devastations. He was defeated, however, with great slaughter, at Northallerton, by some of the northern barons, who had raised a powerful army; and this success so much overawed the malecontents in England, that Stephen's power might have received some stability, had he not unfortunately engaged himself in a contest with the clergy. He had already seen the mischief arising from the liberty he had granted of fortifying so many castles in different parts of the kingdom. He therefore determined to abridge this liberty as much as possible; and for that purpose he began with the castles erected by the clergy, who seemed to have less right to these military securities than the barons. Taking advantage therefore of a fray which had arisen at court between the retinue of the bishop of Salisbury and the Earl of Brittany, he seized the bishops both of Salisbury and Lincoln, threw them into prison, and obliged them to deliver up the castles which they had lately erected. This produced such a violent commotion, that the opportunity seemed favourable to the pretensions of Matilda. On the 22d of September 1139, the Matilda landed in England with Robert Earl of Gloucester, attended only by 140 knights; but her partisans daily increased, and she was soon in a condition to face Ste-

To S
Matilda
landed in
England.

pica

England. phen with equal forces in the field. Numberless encounters happened, the detail of which could afford very little entertainment to the reader. War was spread through every quarter; and the turbulent barons having, in a great measure, shaken off all restraint of government, and now obtained the sanction of fighting in the cause of their country, redoubled their oppressions, tyrannies, and devastations. The castles of the nobility became receptacles of licensed robbers; who, falling forth day and night, spoiled the open country, plundered the villages, and even cities. They tortured the captives to make them reveal their treasures; sold their persons to slavery; and set fire to the houses, after they had pillaged them of every thing valuable. In consequence of this destruction, the land was left untilld; the instruments of husbandry were abandoned; and a grievous famine reduced the nation to the most deplorable state that can be imagined.

111 Stephen de-
feated a pri-
soner.
After a multitude of indecisive conflicts, a battle ensued which seemed likely to ensure the public peace for some time. Stephen had marched his forces to relieve the city of Lincoln; the Earl of Gloucester led a body of troops to assist those of Matilda's party, who were besieging that place. The two armies engaged on the 2d of February within sight of the city, and a desperate battle ensued. At last Stephen's army was defeated. He himself was for some time left without attendants; and fought on foot in the midst of his enemies, assailed by multitudes, and resisting all their efforts with astonishing intrepidity. Being hemmed in on every side, he forced a way for some time with his battle-ax; but that breaking, he drew his sword, and with it furiously assailed his antagonists for some time longer. But at length the sword also flying in pieces, he was obliged to surrender himself a prisoner. He was conducted to Gloucester; and though at first treated with respect, he was in a short time, upon some suspicions, thrown into irons.

112 Matilda
crowned.
About a month after, Matilda was crowned at Winchester with great solemnity; but soon showed herself totally incapable of governing such a turbulent nation. She determined to repress the power of the nobles, who had now left only the shadow of authority to their sovereign. But being destitute of policy or prudence sufficient to accomplish so difficult an undertaking, a conspiracy was soon formed against her, and the bishop of Winchester detached a party of his friends and vassals to block up the city of London where the queen resided. At the same time measures were taken to incite the Londoners to a revolt, and to seize the queen's person. Matilda, having timely notice of this conspiracy, fled to Winchester. Here she was soon after besieged by the bishop: but the town being distressed by famine, she with difficulty made her escape; while her brother the Earl of Gloucester, endeavouring to follow, was taken prisoner, and exchanged for Stephen.

113 Stephen
retired.
Matilda was now obliged to take shelter in Oxford, while Stephen reascended the throne. The civil war broke out with redoubled fury. Many battles were fought, and both parties were involved in many distresses. Matilda escaped from Oxford at a time when the fields were covered with snow, by being dressed all in white, with four knights her attendants dressed in the same colour. Another time Stephen was surprised

England. by the earl of Gloucester at Wilton, and made his escape with the utmost difficulty. At last Matilda was obliged to quit the kingdom; and the death of the earl of Gloucester soon after seemed to give a fatal blow to her interests. In 1153, however, prince Henry, Matilda's son by her second husband Geoffrey, came over to England, in order once more to dispute Stephen's pretensions to the crown. After some success on his first landing, he was opposed by Stephen with a powerful army, and matters seemed likely to come to the decision of a general engagement. But while the two armies continued within a quarter of a mile of each other, a treaty was set on foot by the interposition of William earl of Arundel, for terminating the dispute in an amicable manner. The death of Eustace, Stephen's son, whom he had designed for the throne, which happened during the course of the treaty, facilitated its conclusion. It was agreed, that Stephen should reign during his life, and that justice should be administered in his name; that Henry, on Stephen's death, should succeed to the kingdom; and that William, Stephen's son, should inherit Boulogne and his patrimonial estate. This treaty filled all Europe with joy; and after the barons had sworn to it, Henry left England, and Stephen returned to the peaceable enjoyment of his throne. His reign, however, was but of short continuance; his death happening on the 25th of October 1154.

Henry was on the continent besieging a castle of one of the mutinous barons, when news was brought him of Stephen's death. But, as he was sensible of the goodness of his title, he did not abandon his enterprize till the place was reduced. He then set out on his journey, and was received in England with the utmost joy. The first acts of his reign seemed to promise an happy and prosperous administration. He instantly dismissed the mercenary soldiers who had committed the greatest disorders throughout the nation. He ordered all the castles which had been erected since the death of Henry I. to be demolished, except a few which he retained in his own hands for the protection of the kingdom. The adulterated coin which had been struck during the reign of Stephen was cried down, and new money struck of the right value and standard. He resumed many of those benefactions which had been made to churches and monasteries in the former reigns. He gave charters to several towns, by which the citizens claimed their freedom, and privileges independent of any superior but himself. These charters were the ground-work of the English liberty; for thus a new order, namely, the more opulent of the people, began to claim a share in the administration, as well as the nobility and clergy. Thus the feudal government was at first impaired; and liberty began to be more equally diffused throughout the nation.

Henry II. on his accession to the English throne, found himself possessed of very extensive dominions on the continent. In the right of his father, he possessed Anjou, Touraine, and Maine; in that of his mother, Normandy; in that of his wife, Guienne, Poitou, Saintogne, Auvergne, Perigord, Angoumois, and the Limousin. Soon after, he annexed Brittany to his other states, by marrying his son, who was yet a child, to the heiress of Brittany, who was a child also.

114
His death.

115
Henry II.

England.

also, and was already in possession of the superiority over that province. These territories composed above a third of the French monarchy, and were by far the most opulent part of it; so that Henry, though vassal to the king of France, was greatly superior to him in power: and when England was added to all these, the French king had great reason to apprehend some disaster to himself and family. The king of England, however, resided at too great a distance to be able to employ this formidable power with success against the French monarch. He soon became a kind of stranger in his continental dominions; and his subjects there considered their allegiance as more naturally due to their superior lord, who lived in their neighbourhood, and who was acknowledged to be the supreme head of their nation. Their immediate lord was often at too great a distance to protect them; and a commotion in any part of Henry's extensive dominions gave great advantages against him. The wise and vigorous administration of Henry, however, counterbalanced in a great measure these disadvantages; and he maintained a surprising tranquillity throughout his extensive dominions during the greatest part of his reign.

Henry found no great difficulty in circumscribing the power of the barons; but when he attempted to do the same thing with the clergy, he met with the most violent opposition. That body had carried their independence on the civil power so far, that now they seemed to aim at nothing less than a liberty to commit all manner of crimes with impunity. During the reign of Stephen, they had extorted an immunity from all but ecclesiastical penalties*; and that grant they were resolved to maintain for the future. It may easily be supposed, that a law which thus screened their wickedness, contributed to increase it; and we accordingly find upon record, not less than 100 murders committed by men in holy orders, in the short period since the king's accession, not one of which was punished even with degradation; while the bishops themselves seemed to glory in this horrid indulgence. The king did not make any attempts against them during the life of Theobald archbishop of Canterbury, who was a man of a mild character, and besides had great merit; because, during the former reign, he had refused to put the crown on the head of Eustace, Stephen's son. He died in 1162; and the king, after his death, advanced to the see of Canterbury Thomas a Becket, his chancellor, on whose compliance he thought he might entirely depend.

The new archbishop was the first man of English pedigree, who, since the Norman conquest, had risen to any considerable station. Before his instalment in the see of Canterbury, Becket had been exceedingly complaisant, good-humoured, and agreeable to his master; and had also been accustomed to live very freely. But no sooner was he invested with this high dignity, than he totally altered his conduct, and put on all those airs of affected and ostentatious humility which could recommend him to the superstitious and ignorant multitude in that age. The first step taken by this hypocrite after his advancement, was to resign the office of chancellor. This he did without consulting the king; the reason he gave was, that henceforth he must detach himself from secular affairs, and be solely employed in the duties of his sacred function;

but in reality, that he might break off all connexion with Henry. As he knew that the king intended to abridge the ecclesiastical power, he thought the best method would be to become himself the aggressor. He therefore summoned the earl of Clare to surrender the barony of Tunbridge; which, ever since the Conquest, had remained in the family of that nobleman; but which, as it had formerly belonged to the see of Canterbury, the primate pretended that his predecessors were prohibited by the canons from alienating.—William de Eynsford, a military tenant of the crown, was patron of a living which belonged to a manor that held of the archbishop of Canterbury; and Becket, without regard to William's right, presented, on a new and illegal pretence, one Laurence to that living, who was violently expelled by Eynsford. Upon this, Eynsford was excommunicated. He complained to the king, that he, who held in *capite* of the crown, should, contrary to the practice established by the Conqueror^a and maintained ever since by his successors, be subjected to that terrible sentence, without the previous consent of the sovereign. Henry, by a messenger, commanded Becket to absolve Eynsford. The haughty primate answered, that it belonged not to the king to inform him whom he should absolve, and whom excommunicate; but, after all, he was obliged to comply with the king's orders, though with the worst grace imaginable.

As Henry perceived that the crown was now in danger, through the superstition of the people, of falling totally under the power of the clergy, he resolved to exert himself to the utmost against their scandalous usurpations. Among their other inventions to obtain money, they had now inculcated the necessity of penance as an atonement for sin; and having again introduced the practice of paying them large sums as an equivalent for these penances, the sins of the people had thus become a revenue to the priests; and the king computed, that, by this invention alone, they levied more money from his subjects than what flowed by all the funds and taxes into the royal exchequer. To ease the people of so heavy and arbitrary an imposition, the king required, that a civil officer of his appointment should be present in all ecclesiastical courts, and should for the future give his consent to every composition made for spiritual offences. About this time also the king had an opportunity of proceeding against the clergy on another footing. A clerk in Worcester-shire, having debauched a gentleman's daughter, murdered her father. The king required that the clerk should be delivered up to the magistrate. Becket pleaded the privileges of the church; confined the criminal in the bishop's prison, lest he should be seized by the king's officers; and maintained that no greater punishment could be inflicted on him than degradation. The king then required, that, immediately after he was degraded, he should be tried by the civil powers; but the primate asserted, that it was iniquitous to try a man twice upon the same accusation, and for the same crime. Upon this, Henry summoned an assembly of all the prelates in England; and put to them this decisive question, Whether or not they were willing to submit to the ancient laws and customs of the kingdom? The bishops unanimously replied, that they were willing, *saving their own order*. The king was

England.

* See (Becket's) of Clergy.

116 Monstrous wickedness of the clergy.

117 Contests of the king with Thomas a Becket.

England.

provoked to the last degree at this equivocal answer. He left the assembly with evident marks of displeasure; and required the primate instantly to surrender the castles of Eye and Berkham. The other prelates were terrified; but Becket continued inflexible: however, he was at last prevailed upon, by the interposition of Philip the pope's legate and almoner, to retract the saving clause, and promise without any reserve to observe the ancient customs.

The king was not now to be satisfied with general promises from the clergy. He was determined that the ancient laws and customs should be defined, as well as the privileges of the clergy. He therefore summoned another great council of the clergy and nobility at Clarendon, to whom he submitted this important affair. A number of regulations was there drawn up, which were afterwards well known by the title of the *Constitutions of Clarendon*. By these it was enacted, that clergymen accused of any crime should be tried in the civil courts; that laymen should not be tried in spiritual courts, except by legal and reputable witnesses; that the king should ultimately judge in ecclesiastical and spiritual appeals; that the archbishops and bishops should be regarded as barons, and obliged to contribute to the public expences like other persons of their rank; that the goods forfeited to the king, should not be protected in churches or church-yards by the clergy; and that the sons of villeins should not take orders without the consent of their lord. These, with some others of less consequence, to the number of 16, were subscribed by all the bishops present, and even by Becket himself; who, at first, showed some reluctance.

Nothing now remained but to get the constitutions ratified by the Pope; but in this the king was disappointed. The Pope rejected them with the utmost indignation; and, out of 16, admitted only six, which he thought were not important enough to deserve censure.—Becket was now mortified to the highest degree. He retracted his consent to the constitutions, redoubled his austerities, and even refused to execute any part of his sacerdotal function till he had obtained absolution from his holiness. Henry, considering these humilities as insults offered to himself, desired the Pope to send him a legate. He did so; but annexed a clause to his commission, by which he was prohibited from acting against the archbishop of Canterbury. The king sent back the commission to the Pope; and being now exasperated beyond all patience, commenced furious prosecutions against Becket. He first sued him for some lands belonging to his primacy; and Becket being detained by sickness from coming into court, his non-attendance was construed into disrespect. The primate afterwards defended his cause in person; but all his goods and chattels were confiscated, and the bishop of Winchester was obliged to pronounce the sentence. Another suit was commenced against him for L. 300, which he had levied on the honours of Eye and Berkham, and the primate agreed to give securities for the payment of the sum. The next day a third suit was commenced against him for 1000 marks, which the king had lent him upon some former occasion: and, immediately upon the back of these, a still greater demand was made; namely, that Becket should give an account of the money he had received

and expended during the time he was chancellor. The money was computed at no less than 40,000 marks; and the primate, unable either to give an account, or find securities, took the following extraordinary method of evading the king's designs. He arrayed himself in his episcopal vestments; and with the cross in his hand, went forward to the palace. Having entered the royal apartments, he sat down, holding up the cross as his banner and protection. The king, who sat in an inner apartment, ordered by proclamation all the prelates and nobility to attend him; to whom he loudly complained of Becket's insolence. The whole council joined in condemning this instance of his unaccountable pride; and determined to expostulate with him about his inconsistency concerning the constitutions of Clarendon. But all their messages, threats, and arguments, were to no purpose. Becket put himself, in the most solemn manner, under the protection of the supreme pontiff, and appealed to him against any penalty which his iniquitous judges might think proper to inflict. Then leaving the palace, he asked the king's immediate permission to quit Northampton; but being refused, he secretly withdrew in disguise, and at last found means to cross over to the continent.

Becket was received with the greatest marks of esteem, first by the king of France (who hated Henry on account of his great power), and then by the Pope, whose cause he had so strenuously defended in England. Henry at the same time sent ambassadors to the Pope, who were treated with coolness and contempt, while Becket was honoured with the greatest marks of distinction. These favours bestowed upon an exile and a perjured traitor (for such had been Becket's sentence of condemnation in England), irritated the king to such a degree, that he resolved to throw off at once all dependence upon the Pope. He accordingly issued out orders to his judicaries; inhibiting, under severe penalties, all appeals to the Pope or the archbishop; and forbidding any of them to receive mandates from them, or to apply to their authority. He declared it treasonable to bring over from either of them any interdiction upon the kingdom. This he made punishable in secular clergymen by the loss of their livings, and by castration; in regulars, by the amputation of their feet; and in laymen, by death. On the other hand, the Pope and the archbishop did not fail to issue forth their fulminations in such a manner as to shake the very foundation of the king's authority. Becket excommunicated by name all the king's chief ministers who had been concerned in sequestering the revenues of his see, and all who obeyed or favoured the constitutions of Clarendon. He even threatened to excommunicate the king if he did not speedily repent; and had not the Pope himself been threatened every day with the machinations of an antipope, whose pretensions he was afraid the king of England might support, the sentence of excommunication would certainly have been denounced.

At first, Henry paid little regard to these fulminations; but afterwards, when he found that his authority over his subjects began to decline on that account, and that his rivals on the continent were endeavouring to disturb the tranquillity of his dominions, he began sincerely to desire a reconciliation. This the Pope and

England.

118
Becket flies
to the con-

Becket.

England. Becket also became desirous of, because they saw that their utmost endeavours were insufficient to draw Henry's subjects into a revolt against him. The treaty of accommodation, however, was often broke off, through the extreme jealousy of each of the parties; but at length, by the mediation of the Pope's legate, all differences were adjusted, and Becket was reinstated in the see of Canterbury.

119
Is re-
stated,
and be-
haves
with his
former in-
solence.

On the recovery of his dignity, the primate behaved with all his usual arrogance. Instead of retiring quietly to his diocese when he landed in England, he made a progress through Kent with all the splendor and magnificence of a sovereign pontiff. As he approached Southwark, the clergy, the laity, and all ranks of people, came forth to meet him, and celebrated his triumphal entry with hymns of joy. Being thus confident of the support of the people, he resolved to make his enemies feel the severest effects of his vengeance. He suspended the archbishop of York, who had crowned Henry's eldest son in his absence. He excommunicated the bishops of London and Salisbury, with some of the principal nobility and prelates who had assisted at the coronation. One man he excommunicated for having spoken against him, and another for having cut off the tail of one of his horses. The excommunicated and degraded prelates immediately made their complaints to the king; and he having dropped some passionate expressions, intimating a desire to have Becket's life taken away, the supposed will of the king was instantly accomplished; nor could the king's express orders to the contrary arrive time enough to hinder the execution of this fatal purpose. See BECKET.

120
Grief of the
king for his
death.

The king was thrown into the utmost consternation on hearing of Becket's murder. He knew that the primate's death would accomplish what his most violent opposition during his life could never have done, and therefore he gave himself up to sorrow; for three days he even refused all nourishment; till at last his courtiers were obliged to break in upon his solitude, and induce him to acquiesce in an event which could not possibly be recalled. The pope was with some difficulty made sensible of the king's innocence; but refused to grant him a pardon, except on condition that he should make every future submission and perform every injunction the holy see thought proper to demand. When things were thus adjusted, the assassins who had murdered Becket were allowed to retire in safety to the enjoyment of their former dignities; and the king, with a view to divert the minds of the people to a different object, undertook an expedition into Ireland, and totally reduced that island. See IRELAND.

121
Diffusions
in Henry's
family.

The king was scarce freed from the war with Ireland, and the dangerous controversy which he had engaged in with the church of Rome, when he found himself involved in the most unnatural contests with his children, to whom he had always behaved in the most tender and affectionate manner. He had ordered Henry his eldest son to be appointed king; and had destined him for his successor in the kingdom of England, the duchy of Normandy, and the counties of Anjou, Maine, and Touraine; territories which lay contiguous, and which might thus easily lend their assistance to one another. Richard his second son

was invested in the duchy of Guienne and county of Poitou: Geoffrey, his third son, inherited, in right of his wife, the duchy of Brittany: and the new conquest of Ireland was destined for the appendage of John his fourth son, for whom he had negotiated a marriage with Adelaide the only daughter of Humbert count of Savoy and Maurienne; and with whom he was to receive as a dowry very considerable demesnes in Piedmont, Savoy, Bresse, and Dauphiny. This greatness of Henry's family alarmed the king of France; and he therefore excited young prince Henry to demand of his father, either the immediate resignation of the crown of England, or the duchy of Normandy. The king refused to comply with such an extravagant demand; upon which the prince made his escape to Paris, where he was protected by the French king. This happened in 1173; and the same year, queen Eleanor, finding that he was now grown very disagreeable to the king, communicated her discontent to her two younger children Geoffrey and Richard, whom she engaged also to demand the territories assigned them, and then fly to the court of France. The queen herself was meditating an escape to the same court, and had put on man's apparel for that purpose, when she was seized and confined by Henry's order. The licentious barons in the mean time wished for a change of government; hoping to have liberty, under young and unexperienced princes, to commit those rapines and violences which they could not do with safety when governed by such a prudent and vigilant king as Henry. In the midst of this universal defection, however, the English monarch still retained his usual intrepidity, and prepared with as much vigour as possible for the contest. As he could depend on the fidelity of very few of his nobility, he was obliged to enlist in his service a number of desperate ruffians called *Brabanzons*, and sometimes *Routiers* or *Cotereaux*, though for what reason is not mentioned in history. These banditti were very numerous during the times of the feudal government, when many private wars were carried on between the nobles; and 20,000 of these, with a few forces furnished by his faithful barons, composed the whole of Henry's army on this occasion.

122
Queen E.
leanor con-
fined.

With this force the king of England totally overthrew the schemes of his enemies on the continent; but being very desirous of putting an end to the war, he this very year (1173) agreed to a conference with the king of France. At this interview, Henry offered his children the most advantageous terms. He insisted only on retaining the sovereign authority in all his dominions. To Henry he offered half the revenues of the crown of England, with some places of security in that kingdom; or if he chose rather to reside in Normandy, half the revenues of that duchy, with all those of Anjou. He made a like offer to Richard in Guienne; he promised to resign all Brittany to Geoffrey; and if these concessions were not deemed sufficient, he agreed to add to them whatever the Pope's legates, who were present, should require of him. The conference, however, was broke off by the violence of the earl of Leicester; who not only reproached Henry in the most indecent manner, but even put his hand to his sword, as if he intended to attempt some violence against him.

England.

Prince Henry, who died in the 28th year of his age, left no posterity. His brother Richard succeeded to his dominions, and soon discovered as turbulent a spirit as that which had actuated his brother. He refused to give up Guienne, which Henry had designed for his fourth son John; and even made preparations for carrying on war against his father, and brother Geoffrey. Henry sent for Eleanor his queen, the heiress of Guenne; to whom Richard, either dreading an infurrection in her favour, or out of a sense of duty, willingly yielded up the territory, and retired peaceably to his father's court. This breach, however, was no sooner made up, than Geoffrey, demanded Anjou to be added to his dominions in Brittany. This the king refused; upon which he fled to the court of France, and prepared to levy an army against his father. Henry, however, was freed from the danger which threatened him from that quarter, by his son's death, who was killed in a tournament at Paris. The loss of this prince gave few, except the king himself, any uneasiness; for he was universally hated, and went among the people by the name of the *Child of Perdition*. The widow of Geoffrey, soon after his decease, was delivered of a son, who received the name of *Arthur*, and was invested in the duchy of Brittany, under the guardianship of his grandfather, who, as duke of Normandy, was also superior lord of that territory. Philip, as lord paramount, disputed for some time his title to this wardship; but was obliged to yield to the inclinations of the Bretons, who preferred the government of Henry. Some other causes inflamed the dissension between these two monarchs, and Philip once more seduced Richard from his duty. He insisted, that his marriage with Adelaide, Philip's sister, should be immediately completed, and threatened to enforce his pretensions with a formidable army. This occasioned another conference between Gisors and Trie, the usual place of meeting, under a vast elm that is said to have shaded more than an acre. In the midst of this conference the archbishop of Tyre appeared before the assembly in the most miserable habit, and begged assistance against the infidels, who, under Saladin, had almost totally expelled the Christians from Asia. His intelli-

4 I gence

owns him. 124. The greatest sufferer by this war was William king of Scotland. He was compelled to sign a self Henry's treaty, by which he obliged himself to do homage to Henry for the kingdom of Scotland. It was agreed

125 Henry was now freed from all troubles either at home or abroad, for five years; during which time he made several salutary laws for the good of his kingdom. But, in 1180, the ambitious spirits of his children involved him in fresh calamities. Richard, who had been invested by his father with the sovereignty of Guienne, refused to do homage to his elder brother, as king Henry had required him to do. Young Henry and Geoffrey, uniting their arms, invaded their brother's dominions; and while the king was endeavour-

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England.

gence appeared so very dismal, that the kings of France and England laid aside their animosity. Both of them immediately took the cross; but Richard, who had long wished to have all the glory of such an expedition to himself, could not bear to have even his father for a partner in his victories. He therefore entered into a confederacy with the king of France; so that Henry found himself at last obliged to give up all thoughts of the crusade, in order to defend himself against this unnatural combination. The event of the war proved very unfortunate for Henry, who lost several towns, and narrowly escaped falling into the hands of the enemy himself. At last a treaty was concluded at the intercession of the duke of Burgundy, the count of Flanders, and the archbishop of Rheims; but upon terms very humiliating to the king of England. It was agreed, that Richard should marry the princess Adelaïs, and be crowned king of England during the lifetime of his father; that Henry should pay 20,000 marks to the king of France, as a compensation for the charges of the war; that his own barons should engage to make him observe this treaty, and in case of violating it, to join Philip and Richard against him; and that all his vassals who had espoused the cause of Richard should receive an indemnity for their offence. These

126
His extreme grief
and death.

terms, mortifying as they were, Henry bore with patience; but when, upon receiving a list of the barons that were to be pardoned, he found his own John, who was his favourite, among them, he could no longer support his grief. He broke out into the most lamentable expressions of despair; cursed the day in which he received his miserable being; and bellowed on his ungrateful children a malediction which he could never afterwards be prevailed upon to retract. Soon after, he fell into a lingering fever occasioned by his grief; and of this he died on the 6th of July 1189, in the 38th year of his age and 35th of his reign. His natural son Geoffrey, who alone had behaved dutifully towards him, attended his corpse to the nunnery of Fontevault, where it lay in state in the abbey-church. Next day Richard, who came to visit the dead body of his father, was struck with horror at the sight. At his approach, the blood was seen to gush out at the mouth and nostrils of the corpse; and this accident was, by the superstition of the times, interpreted as the most dreadful rebuke. Richard could not endure the sight. He exclaimed that he was his father's murderer; and expressed a strong, though too late, sense of his undutiful conduct.

127
Richard I.

Richard succeeded to the throne without opposition, immediately after his father's death; and, on his accession, set his mother Eleanor (who had been again confined) at liberty. A romantic desire for strange adventures, and an immoderate zeal for the external rites of religion, were the ruling passions of the times. By the fire of these Richard was inflamed to the highest degree, and therefore behaved as if the whole design of his government had been to attempt the recovery of the Holy Land from the Infidels. The superstition of the people showed itself in a most violent and tragical manner on the very day of the king's coronation. The Jews were the objects of universal hatred, so that Richard had issued orders forbidding any of them from appearing at his coronation. But some of them bringing him large presents from

128
Massacre of
the Jews.

their nation, presumed, notwithstanding these orders, to approach the hall in which the king dined. Being discovered, they were exposed to the insults and injuries of the bystanders; in consequence of which they fled, and were pursued by the people. A report was spread, that the king had given orders to massacre all the Jews. This supposed command was executed in the most cruel manner. Multitudes were slaughtered in the city of London, and this example was followed in most of the cities in England. Five hundred Jews had retired into York castle for safety; but finding themselves unable to defend the place, they murdered their wives and children; threw the dead bodies over the wall against their enemies who attempted to scale it; and then, setting fire to the houses, perished in the flames. The gentry in the neighbourhood, who were all indebted to the Jews, ran to the cathedral where their bonds were kept, and made a solemn bonfire of them before the altar.

Richard immediately began to take measures for his expedition into Palestine. His father had left him 100,000 marks; and this sum he augmented by all expedients he could think of, however pernicious to the public, or dangerous to the royal authority. He set up to sale the revenues and manors of the crown, and several offices of the greatest trust and power. Liberties, charters, castles, were given to the best bidders. His friends warned him of the danger attending this venality; but he told them he would sell the city of London itself, if he could find a purchaser. Numerous exactions were also practised upon all ranks and stations; menaces, promises, and exorbitations, were used to fright the timid, and allure the avaricious. A zealous preacher of those times was emboldened to remonstrate against the king's conduct; and advised him to part with his three daughters, which were pride, avarice, and sensuality. To this Richard readily replied, "You counsel right, my friend; and I have already provided husbands for them all. I will dispose of my pride to the templars; my avarice to the monks; and as for my sensuality, the clergy shall share that among them." At length the king having got together a sufficient supply for his undertaking, and even sold his superiority over Scotland for a moderate sum, set out for the Holy Land; whither he was impelled by repeated messages from the king of France, who was ready to embark in the same enterprise.

An account of Richard's exploits in this expedition is given under the articles EGYPT, SICILY, CYPRUS, &c.—Having at last concluded a truce with Saladin, he set out on his return for England. He was, however, at a loss how to proceed. He durst not return by the way he came, as this would put him in the power of the king of France, between whom and the king of England an irreconcilable enmity had taken place. No way therefore was left, but by going more to the north; for which reason he took shipping for Italy, but was wrecked near Aquileia. From thence he travelled towards Ragusa, and resolved to make his way through Germany in the habit of a pilgrim. But his expences and liberalities having betrayed him notwithstanding this disguise, he was arrested by Leopold duke of Austria, who commanded him to be loaded with shackles. This prince had served under Richard.

129
Richard's
preparations for his
journey into
Palestine.

130
Taken pri-
soner on his
return.

at.

England

at the siege of Acres (the ancient Ptolemais), where having received some disgust, he took this base method of revenging himself. Henry VI. emperor of Germany, was then equally an enemy to Richard on account of his having married Berengaria the daughter of Tancred king of Sicily. He therefore required the royal captive to be delivered up to him, and stipulated a large sum of money to the duke as a reward for his service.

The kingdom of England in the mean time was in great confusion. Richard had left it under the direction of Hugh bishop of Durham, and Longchamp bishop of Ely. The tempers of these prelates being very different, an animosity between them soon took place. Longchamp at last arrested his colleague, and obliged him to resign his power in order to obtain his liberty. The king, by many letters, commanded Longchamp to replace his coadjutor, but to no purpose. When the situation of the king became uncertain, Longchamp tyrannized to such a degree, that John the king's brother thought proper to oppose him. He then left the kingdom; and upon this the archbishop of Rouen was made justiciary in his room. The king of France being informed of these dissensions, strove to increase them as much as possible; and had even almost prevailed upon John to throw off his allegiance, by promising to put him in possession of all Richard's continental dominions.

131
Treachery
of John the
king's brother.

When the English first received the news of Richard's captivity, a general indignation was excited through the whole nation. The greatest, and almost the only traitor in the kingdom, was the king's own brother John. On the very first invitation from the court of France, he went abroad; and held a consultation with Philip, the object of which was the perpetual ruin and captivity of his unhappy brother. He promised to deliver into Philip's hands a great part of Normandy; and, in return, he received the investiture of all Richard's transmarine dominions: it is even said, that he did homage to the French king for the crown of England.

In consequence of this treaty, Philip invaded Normandy, and made considerable progress in the conquest of it. He was, however, at last repulsed by the Earl of Leicester, who was now returned from the Holy Land; and a truce was concluded on condition of paying the French king 20,000 merks, and putting four castles into his hands by way of security for the payment.—John, who had come over to England, met with still less success in his enterprises. He was only able to make himself master of the castles of Windsor and Wallingford; but when he came to London, and demanded the kingdom as heir to his brother, of whose death he pretended to have received certain intelligence, he was rejected by all the barons, and measures were taken to oppose and subdue him. The defence of the kingdom was so well provided for, that John, after some fruitless efforts, was obliged to conclude a truce with his opponents; and, before the expiration of it, he thought proper to retire to France, where he openly acknowledged his alliance with Philip.

All the efforts of Richard's enemies proved ineffectual to detain him in captivity. He was brought before the diet of the empire at Worms, where the emperor Henry brought against him a charge of many

crimes and misdemeanours; but to this the king replied with so much spirit and eloquence, that the German princes exclaimed loudly against the conduct of the emperor; the Pope threatened him with excommunication; and Henry, who had hearkened to the proposals of the king of France and prince John, found that it would be impossible for him to execute his and their base purposes, and detain the king of England any longer in captivity. He therefore concluded a treaty with him for his ransom; and agreed to restore him to his liberty for 150,000 merks, about L. 300,000 of our money, of which 100,000 merks were to be paid immediately, and 67 hostages delivered for the remainder.

England

The money for the king's ransom was most cheer-¹³⁶fully raised by the English. The churches and monasteries melted down their plate to the amount of 30,000 merks; the bishops, abbots, and monks, paid a fourth part of their yearly rent; the parochial clergy contributed a tenth part of their tithes; and the requisite sum being thus collected, queen Eleanor and Walter archbishop of Rouen set out with it for Germany, paid the money to the emperor and duke of Austria at Mentz, delivered them hostages for the remainder, and freed Richard from his captivity. His escape was very critical. Henry had been detected in the assassination of the bishop of Liege, and in an attempt of the like nature on the duke of Louvaine; and finding himself extremely obnoxious to the German princes on account of these odious practices, he had determined to seek support from an alliance with the French king, and to detain Richard in perpetual captivity, notwithstanding the sum he had already received for his ransom. He therefore gave orders that Richard should be pursued and arrested; but the king making all imaginable haste, had already embarked at the mouth of the Scheldt, and was out of sight of land when the emperor's messengers reached Antwerp. The king of France no sooner heard of Richard's deliverance, than he wrote to John his confederate in these terms: "Take care of yourself: the devil is broke loose."

The king of England returned from captivity on¹³³ the 20th of March 1194, and was received with the utmost joy by his subjects. He had been but one day landed, when his treacherous brother John came to make his submission. At the intercession of queen Eleanor he was received into favour. "I forgive him (said the king), and hope I shall as easily forget his offences as he will my pardon." Richard was impatient to revenge himself on the king of France, and therefore instantly made war upon him. But though both kings were inflamed with the most violent resentment against each other, they found it impossible to engage their powerful barons heartily in their cause. The war, therefore, produced no remarkable event; and, in 1195, was concluded by a truce for five years. On some slight occasion it was ready to break out anew, when the pope's legate interposed, and a treaty was about to be concluded. King Richard in the mean time was wounded by an arrow at the siege of Chalus, a castle of Limoges. The wound was not in itself dangerous; but being unskillfully treated, a mortification ensued, and the king expired on the 6th of April 1199, in the 10th year of his reign and 42d of

134
His death.

England. his age. By his will he left the kingdom to his brother John, but distributed a fourth part of his treasure among his servants.

135 John succeeded to the crown of England without opposition, but soon found his affairs embarrassed on the continent. The king of France, who, during the life of king Richard, had always supported the pretensions of John, now gave a like support to the claims of prince Arthur the son of Geoffrey, who, though only 12 years of age, promised to be deserving of the kingdom. But in this matter the king of France showed so much regard to his own interest, that Constantia the mother of the young prince, thinking that he ally designed to keep for himself the provinces which he pretended to conquer for Arthur, submitted herself and her son to John, who detained them in Mans; and thus became undisputed master of the whole empire.

136 His bad qualities. The new king was weak, tyrannical, cruel, and treacherous. In short, he seemed to be endowed with almost every bad quality that can fall to the share of man. His conduct, therefore, soon rendered him universally odious. Imagining himself now secure on the side of France, he indulged his passion for Isabella the daughter and heiress of the count of Angouleme, with whom he was much enamoured. His queen, the heiress of the family of Gloucester, was still alive; and Isabella was married to the count de la Marche, tho', by reason of her youth, the marriage had not been consummated. John persuaded the count de Angouleme to carry off his daughter from her husband; at the same time that he procured, under some pretence or other, a divorce from the queen. Thus he incurred the displeasure of the pope, and also of the count de la Marche, and a powerful confederacy was formed against him.

As John had neither courage nor policy sufficient to keep his barons in awe, he took a method for that purpose equally base and cruel. This was by hiring a set of ruffians, whom he called his *champions*, to fight duels with them, in cases where they required to clear themselves from any charge by fighting a duel, according to the custom of those times. Thus he proposed to get rid of his refractory barons; but they, despising opponents who were so far below their rank, refused to fight with them, and a dangerous combination was formed among the barons against him.

137 Murdershis nephew. The murder of prince Arthur rendered John still more generally detested. The young prince with his mother had fled to the court of France, where they were received with the greatest kindness, and found their interests more vigorously supported than before. Their enterprises were attended with considerable success, when Arthur himself had the misfortune to be taken prisoner. All the other captives were sent to England; but the prince was shut up in the castle of Falaise, and from that time was never heard of. It was universally believed that John had murdered him with his own hand; and this inflamed the general resentment against him to such a degree, that he soon after lost all his French provinces. In 1205, the duchy of Normandy itself was also conquered by Philip, and John was forced to fly with disgrace to England.

The king was resolved to wreak his vengeance upon the barons, who, he pretended, had deserted his stand-

ard in Normandy. For this reason, he levied large sums on their estates; in order, as he said, to undertake an expedition to the continent. This expedition, however, he several times capriciously deferred; and once having ventured out to sea, returned again without making the smallest attempt. At last, he landed at Rochelle, and burnt the city of Angiers; but hearing that the enemy were preparing to oppose him, he returned without attempting any thing else.

This irresolute and cowardly behaviour of John made him contemptible in the eyes of his subjects; but the Norman princes had so far extended the prerogatives of the English crown, that the barons, however discontented, durst not yet attempt to change the form of government. John, by entering into a controversy with the church, completed his ruin. The clergy, who for some time had acted as a community totally independent of the civil power, had their elections of each other generally confirmed by the pope, to whom alone they owed subjection. The election of archbishops, however, had been a subject of continual dispute between the suffragan bishops and the Augustine monks. In the mean time the archbishop of Canterbury died; and the Augustine monks, in a very private manner, elected Reginald, their superior, in his place. The bishops exclaimed against this election, as a manifest innovation of their privileges; and a furious theological contest was likely to ensue. John very imprudently took a side in this controversy, and espoused the cause of the suffragan bishops; in consequence of which, John de Grey bishop of Norwich was chosen. The cause was appealed to Rome; and Pope Innocent III. seizing with avidity an opportunity of extending his power, commanded the monks to choose cardinal Stephen Langton, an Englishman, then at the court of Rome. The being able to nominate an archbishop of Canterbury (a person of almost equal authority with the king), was an acquisition that would effectually give the court of Rome an unlimited authority over England. John therefore was resolved not to submit to this imposition; but he had not judgment sufficient to conduct him. He violently expelled the monks from their convent, and seized upon their revenues. The pope, perceiving from this absurd conduct, that John was unequal to the task he had undertaken, after some intreaties, threatened to put the whole kingdom under an interdict. The prelates threw themselves on their knees before the king, and in the most earnest manner intreated him to avoid the resentment of the holy tribunal, by receiving the primate, and restoring the monks to their convent. John, however, broke out into the most violent invectives. He swore by *God's teeth* (his usual oath), that if the kingdom was put under an interdict, he would banish the whole body of the clergy, and confiscate all their possessions. The pope at last, finding he might do it with safety, issued forth this terrible sentence so much dreaded by the whole nation. A stop was immediately put to divine service, and the administration of all the sacraments except baptism. The church-doors were shut, and the images of the saints laid on the ground. The dead were refused Christian burial; and were thrown into ditches and on the highways, without any funeral solemnity. Marriage was celebrated in the churchyards, and the people prohibited the use of meat as

138 His contest with the Pope.

139 The king's interdict.

England. in times of public penance. They were debarred from all pleasure; even from shaving their beards, saluting each other, or paying any regard to their apparel. The clergy deplored the unhappy state of the nation in the most lamentable manner; while John, in revenge, imprisoned all their concubines, and treated the adherents of Langton with the utmost rigour.

The furious and imprudent efforts of John proved totally ineffectual. He had scarce a friend left in the whole nation; and therefore, in 1209, the pope denounced a sentence of excommunication against him. This was soon followed by another still more terrible; namely, the absolving all the subjects of the king of England from their allegiance, and declaring every one to be excommunicated who had any commerce with him at his table, council, or even in private conversation. The king, rendered quite furious by these repeated indignities, wreaked his vengeance on his unhappy subjects, whose affections he ought rather to have attempted to conciliate. The pope, therefore, proceeded to execute the full measure of his wrath on this devoted prince, by giving away his kingdom to Philip of France. He published a crusade all over Europe against king John; exhorting the nobility, the knights and men of every condition, to take up arms against him, and enlist under the French banner. Philip was not less active on his part. He summoned all the vassals of the crown to attend him at Rouen; and having collected a fleet of 1700 vessels, was ready, in 1213, to invade England.

The pope had now overstretched his power; and had the English nation been governed by a prince of any degree of prudence or resolution, the power of the clergy would in all probability have been totally broken. The people, however superstitious and ready to obey in matters of religion, could not tamely submit to be given away by the pope as slaves from one master to another; and therefore this consideration, added to the natural antipathy subsisting between the French and English, put John, notwithstanding all his offences, at the head of an army of 60,000 men. But the pope was too great a politician to suffer matters to be carried to extremities. He promised himself many more advantages from the submission of John than from an alliance with Philip; and therefore came over in person, or, according to some, sent over his legate, to England, under pretence of conferring with the barons, but in reality to hold a conference with John. He there represented to this forlorn prince, the numbers of the enemy, the hatred of his own subjects, and the secret confederacy there was against him in England. He intimated, that there was but one way to secure him from the impending danger; namely, to put himself under the protection of the pope, who was a merciful father, and still willing to receive a repenting sinner. The abject and irresolute spirit of John submitted to this last piece of arrogance, and he took an oath to obey whatever the pope should command. In consequence of this oath, he took another, the most extraordinary mentioned in the records of history; and which, as it was taken while he commanded an army of 60,000 men, discovers a meanness of spirit almost incredible. The terms imposed by it were expressed in the following words. "I John, by the grace of God king of England and lord of Ireland, in order to

England. expiate my sins, from my own free will, and the advice of my barons, give to the church of Rome, to pope Innocent and his successors, the kingdom of England, and all other prerogatives of my crown. I will hereafter hold them as the pope's vassal. I will be faithful to God, to the church of Rome, to the pope my master, and his successors legitimately elected. I promise to pay him a tribute of 1000 merks; to wit, 700 for the kingdom of England, and 300 for the kingdom of Ireland."

This oath was taken by the king before all the people, kneeling, and with his hands held up between those of the legate. Having then agreed to reinstate Langton in the primacy, he received the crown which he had been supposed to have forfeited; while the legate, to add to his former infelicity, trampled under his feet the tribute which John had consented to pay. — The king of France was enraged at this behaviour of the pope; and resolved to execute his project of conquering England, in spite of him and all his censures. His fleet, however, was attacked in their harbours by the English, who took 300 vessels, and destroyed about 100 more; while Philip, finding it impossible to prevent the rest from falling into the hands of the enemy, set fire to them himself, and thus was obliged to give up all hopes of success.

John being thus freed from all danger, continued to follow the same cruel and tyrannical measures which attempt to had hitherto rendered him odious to his subjects. His scandalous subjection to the clergy, now gave the barons an opportunity of exerting themselves, in order to reduce the enormous prerogatives of the crown. Their designs were greatly facilitated by the concurrence of Langton the primate, who on all occasions showed a sincere regard for the interests of the kingdom. At a synod of his prelates and clergy, convened in St Paul's, on pretence of examining into the losses of some bishops who had been exiled by John, he privately conferred with a number of barons, to whom he expatiated upon the vices and injustice of their sovereign. He showed them a copy of Henry the first's charter; (being the only one in the kingdom, and which had been buried in the rubbish of an obscure monastery). Langton exhorted the barons to insist on a renewal of it; and this they solemnly swore to perform. The same agreement was afterwards renewed at a more numerous meeting of barons summoned by Langton at St Edmundbury. Here it was resolved, that at Christmas they would prefer their common petition in a body; and in the mean time they separated with a design to put themselves in a posture of defence, enlist men, and fortify their castles. In the beginning of January 1215, they repaired to London, accoutred in their military garb and equipment, and presented their petition to the king, alleging that he had promised to grant a confirmation of the laws of Edward the Confessor, at the time he was absolved from his excommunication. John refused their presumption; and required a promise under their hands and seals, that they would never demand, or attempt to extort, such privileges for the future. This they refused with such unanimity and resolution, that the king desired time to consider of their demands. He promised, that, at the festival of Easter, he would give a positive answer to their petition; and offered them the archbishop of Canterbury, the bishop of

140
The king excommunicated, and the kingdom given to Philip of France.

England.

142
The barons reduce the prerogatives of the crown.

141
John's submission to the pope.

Ely,

England. Ely, and the earl marshal, as sureties for fulfilling his engagements.

The barons accepted of his securities, and departed peaceably; but John had no design of complying with their desires. He had recourse to the clergy, whose power he had seen and felt in so many instances. He courted their favour, by granting them a charter establishing all those rights of which they were already in the possession, and which he now pretended to confirm when he had not the liberty to refuse. To ingratiate himself still farther with this body, he took the cross, and appealed to the pope against the usurpation of the barons. The pope wrote letters to England, reproaching the primate and bishops with favouring these defensions; and commanded them to promote peace between the two parties. He exhorted the barons to conciliate the king, not with menaces, but with humble intreaties; and promised, upon their obedience, to interpose his own authority in favour of such of their petitions as he should find to be just. At the same time he annulled their association, and forbade them to enter into any confederacy for the future.

The barons paid no regard to the pope's remonstrances; knowing that the fulminations of the court of Rome would be of little avail, unless they were seconded by the clergy of England. After waiting till Easter, when the king promised to return them an answer, they met by agreement at Stamford. There they assembled a force of above 2000 knights, and a prodigious number of foot. Thence they marched to Brackley, about 15 miles from Oxford, the place where the court then resided. John, hearing of their approach, sent the archbishop of Canterbury, the earl of Pembroke, and others of his council, to know the particulars of their request, and what those liberties were which they so much importuned him to grant. The barons delivered a schedule containing the chief articles of their demands, founded on the charters of Henry and Edward; but which were in the highest degree displeasing to the king. He burst into a furious passion, asked the barons why they did not also demand his kingdom, and swore that he would never comply with such exorbitant demands. The confederates then chose Robert Fitzwalter for their general; whom they dignified with the title of "Marshal of the army of God and of the holy church." They laid siege to Northampton, took Bedford, and were joyfully received into London. They wrote letters to all the nobility and gentry who had not yet declared in their favour, threatening their estates with devastation in case of refusal or delay.

In the mean time the king was left at a place called *Odiham* in Surrey, attended only by seven knights. He vainly endeavoured to avert the storm by the mediation of his bishops and ministers. He appealed to Langton against the barons, not suspecting that he was engaged in the confederacy; and desired him to fulminate the church-censures against those who had made war upon their lawful prince. Langton declared that he would pass no censure where he found no delinquent; but said, that much might be done if the king would dismiss some foreign auxiliaries which he had lately brought over. Upon this John disbanded a great body of Germans and Flemings whom he had hitherto retained in his service, and Langton refused

to excommunicate a single baron. The king, being now quite defenceless, was obliged at last to comply with the demands of his subjects. A conference was accordingly appointed, and all things were adjusted for this most important treaty.

The king's commissioners met the barons at a place ¹⁴³ They force called *Rummede*, between Staines and Windsor; and which is yet held in reverence as the spot where the standard of freedom was first erected in England. Here the king signed the charter called *Magna Charta*; which continues in force to this day, and is still regarded as the great bulwark of British liberty. See *Magna Charta*.

This charter, however, at the time that it was made, ¹⁴⁴ Principal secured liberty to the clergy, barons, and gentlemen, articles of it. much more than to the bulk of the people, who did not for a long time obtain any privileges of importance. Freedom of elections was secured to the clergy; and it was determined, that fines on them for any offence, should be laid on in proportion to their estates, and not the value of their benefices. The privileges secured to the barons were, either abatements in the rigour of the feudal laws, or relief from arbitrary and ambiguous decisions before the courts. It was also decreed, that barons should recover the lands of their vassals, even though forfeited by felony, after having been in the possession of the crown for a year and a day; and no tax was to be imposed without consent of the great council of the nation, excepting in case of the captivity of the king, the knighting of his eldest son, or marrying his eldest daughter. No land belonging to any baron was to be seized for a crown debt, unless the possessor had not personal property enough to pay it; neither was any vassal to be allowed to sell so much of his land as to incapacitate him from performing the necessary service to his lord. It was also determined, that when the great council of the nation was called, the prelates, earls, and barons, should be summoned by a particular writ, and the lesser barons should receive a summons from the sheriff. In favour of the people it was stipulated, that they should have from the barons all the immunities and privileges granted by the king to the former. Merchants were to be allowed to carry on their business without any arbitrary tolls or impositions, and to go out of the kingdom and return at pleasure. The goods of every freeman were to be disposed of according to his will; or if he died intestate, the nearest heir should succeed him. No carts, horses, or wood, were to be taken by the crown officers without the consent of the owner. The king's courts were to be stationary, and no delay to be made in doing justice to every one; no freeman should be taken or imprisoned, dispossessed of his free tenement, outlawed or banished, unless by the legal judgment of his peers, &c. It was likewise stipulated, that London should remain in the hands of the barons, and the tower be assigned to the primate, till the 15th of August following; or till the articles of the charter should be fulfilled. To give the more security for this, the king allowed them to choose 25 of their own number, to whose authority no limits were set either in extent or duration. If any complaint were made of a violation of the charter, either by the king, or his officers, any four of the barons might admonish the king to redress the grievance; and if satisfaction were not obtained,

to sign *Magna Charta*.

Principal articles of it.

England. obtained, they might assemble the whole council of 25; and they, in conjunction with the great council, were empowered to compel him to fulfil the charter. In case of his resistance, they had liberty to levy war against him, attack his castles, and use every kind of violence, except against his person, or those of the queen or children. All men throughout the kingdom were bound, under the penalty of confiscation, to swear obedience to the 25 barons; and the freeholders of each county were to choose 12 knights, whose business it was to report such evil customs as ought to be redressed in terms of Magna Charta.

But although John had thus obliged himself, by writing, to allow liberty to his subjects, he had no mind that they should enjoy it in reality. The sense of his subjection to his own vassals sunk deep in his mind. He became sullen, silent, and reserved. He thinned the society of his former friends; and retired into the Isle of Wight, as if to hide his disgrace in solitude; but, in reality, to meditate revenge against the barons. He sent to the continent to enlist a large body of mercenary troops, and made complaints to the pope of the insurrections of the barons against him. The pontiff very warmly espoused his cause; a bull was sent over, annulling the whole charter; and at the same time the foreign troops arriving, the king once more found himself in a condition to demand his own terms from his subjects.

The barons had made no preparations for war, not suspecting the introduction of a foreign army. The king, therefore, was for some time undisputed master of the field, and the most horrid cruelties were committed by his army. The nobility who had been most active in procuring the great charter fled with their families to Scotland, where they obtained the protection of king Alexander by doing homage to him. The barons being totally unable to raise an army capable of contending with that of John, applied to their old enemy Philip of France, offering to acknowledge his eldest son Louis for their sovereign, on condition of his protecting them from the fury of John and his mercenaries. The French king accepted their proposal with joy; and twenty-five hostages which he demanded being sent over, began to make the most diligent preparations for this expedition, regardless of the menaces of the pope, who threatened him with excommunication, and actually excommunicated his son Louis some time after.

The first troops who came to the assistance of the barons, were only a body of 7000 men; but, soon after, Louis with a powerful army landed at Sandwich. The first effect of this invasion was, that most of John's foreign troops deserted, refusing to serve against the heir of their monarchy. Many considerable noblemen also deserted his cause, and Louis daily gained ground. This prince advanced to London, where the barons and burghers did him homage, and took the oath of allegiance, after he had sworn to confirm the liberties and privileges of the people. His imprudence, however, in preferring on all occasions his French subjects to the English, soon excited a jealousy against him, which proved very prejudicial to his cause. This jealousy was greatly increased by the death-bed confession of the count de Melun, one of his courtiers, who declared to those about him, that it was Louis's design to exterminate the English barons as traitors,

and to bestow their dignities and estates upon his French subjects, on whose fidelity he could more safely rely. This caused a considerable desertion among Louis's party: so that John once more found himself in a condition to make an effort for his crown. He resolved to penetrate into the heart of the kingdom; and, for this purpose, he departed from Lynn, and took the road towards Lincolnshire at the head of a great body of troops. His road lay along the shore, which was overflowed at high water; but the king, not being apprised of this, or being ignorant of the tides of the place, lost all his carriages, treasure, and baggage by their influx. He himself escaped with the utmost difficulty, and arrived at the abbey of Swinestead; where his grief for the loss he had sustained, and the distracted state of his affairs, threw him into a fever, which soon appeared to be attended with fatal symptoms. He died at Newark in the year 1216, the 51st of his age, and 18th of his reign. He left king John's 247
Death of
king John's 248
two legitimate sons: Henry, who succeeded him on the throne, and was about nine years of age; and Richard, who was about seven. He left also three daughters; Jane, married to Alexander king of Scotland; Eleanor, married to the Earl of Pembroke; and Isabella, married to the emperor Frederic II.

When John died, the Earl of Pembroke was marshal of England. By this office he was at the head of the army, and of consequence, in times of such turbulence, at the head of the state. He was a nobleman of great honour and fidelity, and had continued faithful to John in his greatest reverses of fortune. He now determined to support the authority of the infant prince Henry; and therefore carried him immediately to Gloucester, where the ceremony of coronation was performed, in the presence of Gualo the legate and a very few noblemen, by the bishops of Winchester and Bath. The young prince was obliged to swear fealty 148
Henry III. to the pope, and renew the homage which his father had done for the kingdom; after which the Earl of Pembroke was chosen protector.

Till the king arrived at the years of maturity, the transactions of his reign can only be considered as the consequences of the disposition of his tutors. Pembroke caused him grant a new charter of liberties, consisting of the concessions extorted from John, with some alterations; and the next year it was renewed, with the addition of some other articles. Thus these famous charters were brought very nearly to the shape in which they have ever since stood; and they were, during many generations, esteemed the most sacred rampart to national liberty and independence. As they secured the rights of all orders of men, they were anxiously defended by all, and became in a manner the basis of the English monarchy, and a kind of original contract, which both limited the authority of the king, and ensured the conditional allegiance of his subjects. Though often violated, they were still claimed and recalled by the nobility and people; and as no precedents were supposed valid that infringed them, they rather acquired, than lost, authority, from the frequent attempts made against them, in several ages, by regal and arbitrary power.

These charters were made use of by Pembroke as arguments to draw off the malecontent barons from their allegiance to Louis. He represented to them, that, whatever

England.

whatever jealousy they might have entertained against the late king, a young prince, the lineal heir of their ancient monarchs, had now succeeded to the throne, without succeeding either to the resentments or principles of his predecessor: That the desperate expedient, which they had employed, of calling in a foreign potentate, had, happily for them, as well as for the nation, failed of entire success; and it was still in their power, by a quick return to their duty, to restore the independence of the kingdom, and to secure that liberty for which they so zealously contended: That, as all past offences of the barons were now buried in oblivion, they ought, on their part, to forget their complaints against their late sovereign; who, if he had been anywise blameable in his conduct, had left to his son the salutary warning to avoid his paths, which had led to such fatal extremities: And that, having now obtained a charter for their liberties, it was their interest to shew, by their conduct, that that acquisition was not incompatible with their allegiance; and that the rights of the king and people, so far from being hostile and opposite, might mutually support and sustain each other.

150
Decline of
prince
Louis's par-
ty.

These considerations, enforced by Pembroke's known character of constancy and fidelity, had a very great influence on the barons. Most of them began to negotiate with him, and many actually returned to their duty. At the same time Louis continued to disgust those of his own party by the preference which he visibly gave to the French. Though he went over to France, therefore, and brought fresh succours from thence, he found that his party was greatly weaker than before, by the desertion of his English confederates; and that the death of king John had, contrary to his expectations, occasioned the total ruin of his affairs. In a short time Pembroke was so much strengthened by deserters from Louis's party, that he ventured to invest Mount-Sorel; though upon the approach of the count de Perche with the French army, he desisted from that enterprise. The French general immediately marched to Lincoln; and, being admitted into the town, laid siege to the castle, and soon reduced it to extremity. Pembroke summoned his forces from every quarter, in order to relieve this important place; and he appeared so much superior to the French, that they shut themselves up within the city, resolving to take shelter there. But the garrison of the castle, having received a strong reinforcement, made a vigorous sally upon the besiegers, while the English army assaulted them from without. The French army was totally routed; the count de Perche with only two persons more were killed; but many of the chief commanders, and about 400 knights, were made prisoners. On the news of this fatal event, Louis raised the siege of Dover, and retired to London; where he received intelligence of a new disaster, which put an end to all his hopes. A French fleet, which carried a strong reinforcement, had appeared on the coast of Kent; where they were attacked and repulsed with considerable loss, by Philip D'Albiny. He is said to have gained the victory by the following stratagem. Having got the wind of the French, he came down upon them with violence; and throwing on their faces a great quantity of quicklime, which he purposely carried on board, they were so blinded that they were

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disabled from defending themselves. This misfortune so discouraged the barons who yet adhered to Louis, that they came from every quarter to make their submission to Pembroke; and Louis himself, finding his affairs totally desperate, was glad to make his escape from a country where every thing was become hostile to him. He therefore concluded a peace with the Protector; promised to evacuate the kingdom; and only stipulated, in return, an indemnity to his adherents, and a restitution of their honours and fortunes, together with the free and equal enjoyment of those liberties which had been granted to the rest of the nation.

England.

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He leaves
the king-
dom.

When the king grew up, he was found to be very unfit for the government of such a turbulent people as the English at that time were. Though his temper was mild and humane, he was also very weak, fickle, and irresolute. He disgusted the people by the caresses he bestowed on foreigners; and this disgust rose once to such a height, that the barons refused to assemble in the general council of the nation, or parliament, at his desire. When commanded to do so, they sent a message to Henry, desiring him to dismiss his foreigners; otherwise they would drive both him and them out of the kingdom, and put the crown on the head of one who was more worthy to wear it. The facility of Henry's temper also induced him to heap riches upon his foreign favourites in a manner which he could by no means afford: this often brought him into very great straits; and to relieve himself, he was obliged to have recourse to many arbitrary measures, which he could not otherwise have chosen. Nothing, however, of very great moment happened till the year 1255, when the Pope found means to embark Henry in a scheme for the conquest of Naples, or Sicily on this side the Fare, as it was called; an enterprise which not only brought much dishonour on the king, but involved him for some years in very great expense and trouble. The court of Rome some time before had reduced the kingdom of Sicily to the same state of feudal vassalage which she pretended to exercise over England; but Mainfroy, an usurper, under pretence of governing the kingdom for the lawful heir, had seized the crown, and was resolved to reject the Pope's authority. As the Pope found that his own force alone was not sufficient to gain his point, he had recourse to Richard the king of England's brother, who had been created Earl of Cornwall, and had such talents for amassing money, that he was reckoned the richest prince in Christendom. To him the Pope offered the kingdom of Sicily, upon the single condition of his conquering it from the usurper. Richard was too wise to accept this offer; upon which the Pope applied to Henry, and offered him the crown of Sicily for his second son Edmund. Henry, dazzled by this proposal, without reflecting on the consequences, or without consulting his brother or the parliament, gave the Pope unlimited credit to expend whatever sums he thought necessary for completing the conquest of Sicily. In consequence of this unlimited grant, his holiness determined to exert his apostolical authority to the utmost, in extorting money from the English. A crusade was published, requiring every one who had taken the cross against the infidels, and even vowed to advance money for that purpose, to support the war against Mainfroy, whom he accused as being a more terrible enemy

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The pope
undertakes
the con-
quest of
Sicily for
Henry's
son.

153
Intolerable
extortions
by his
holiness.

England

enemy to the Christian faith than any Saracen. A tenth on all the ecclesiastical benefices in England was levied for three years; and orders were given to excommunicate the bishops who did not make punctual payment. A grant was made to the king of the goods of interlate clergymen, as well as of the revenues of vacant benefices and those of non-residents. These taxations, however grievous, were submitted to with little murmuring; but another suggested by the bishop of Hereford excited the most violent clamours. This prelate, who at that time resided at the court of Rome, drew bills on all the abbots and bishops of the kingdom, to the amount of no less than 150,540 marks, which he granted to Italian merchants in consideration of the money they had advanced or pretended to advance for the support of the Sicilian war. As it was apprehended that the English clergy would not easily submit to such an extraordinary demand, a commission was given to Ruffand, the Pope's legate, to use his authority. An assembly of the prelates and abbots was accordingly summoned; who, on hearing the proposal sanctified with the names both of the Pope and King, were struck with the utmost surprise and indignation. A violent altercation took place; during which the legate told them, that all ecclesiastical benefices were the property of the Pope, and that he might dispose of them as he pleased. The affair ended, however, in the submission of the clergy; but the barons still continued refractory, and for some time answered the king's demands of supplies with expostulations; urging the king's partiality to foreigners, and the various injuries the nation had sustained from the servants of the crown. The great council of the nation, which had lately obtained the name of *parliament*, was therefore dissolved, and another called, but with as little success as before. The king, however, had involved himself in so much debt, that a large supply was become absolutely necessary; and as that could by no means be obtained from parliament, he was now reduced to the humiliating expedient of going about among such of his subjects as he thought most attached to him, and begging assistance from them at their own houses. At length his barons, perceiving the exigencies to which he was reduced, seemed willing to afford him aid; and, upon his promising to grant them a plenary redress of grievances, a very liberal supply was obtained, for which he renewed their charter with more than usual solemnity. All the prelates and abbots were assembled with burning tapers in their hands; the magna charta was read in their presence; and they denounced sentence of excommunication upon all who should infringe upon its decisions. They then put out their tapers on the ground, and exclaimed, "May every soul that proves false to this agreement sink and corrupt in hell." The king subjoined, "So help me God, I will inviolably keep all these things, as I am a man, as I am a Christian, as I am a knight, and as I am a king crowned and anointed."

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Henry
renewed
Magna
Charta.

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He breaks
his engage-
ments,
which oc-
casioned a
revolution.

No sooner had the king received the supplies of which he stood so much in need, than he forgot all his engagements, put his confidence entirely in foreign counsellors, and evaded or broke through in numberless instances the charters he had given. This conduct rendered him so obnoxious to the barons, that Simon Mountfort Earl of Leicester, a man of a very violent

and ambitious temper, determined to attempt an innovation in the government. He formed a powerful confederacy against the king, and the designs of the conspirators were effectually put in execution in the year 1258. Henry had summoned a parliament in expectation of receiving supplies for his Sicilian project; when the barons appeared in the hall, clad in complete armour, with their swords by their sides. The king, struck with this unusual appearance, asked them what was their purpose, and whether they pretended to make him their prisoner? Roger Bigod, Earl Marischal, answered in name of the rest, that he was not their prisoner; that they even intended to grant him large supplies, in order to fix his son on the throne of Sicily; that they only expected some return for this expence and service; and that as the king had frequently made submissions to the parliament, had acknowledged his past errors, and had still allowed himself to be carried into the same path, which gave them such reason of complaint, he must now yield to more strict regulations, and confer authority on those who were able and willing to redress the public grievances. Henry instantly assured them of his intentions to grant them all possible satisfaction; and for that purpose summoned another parliament at Oxford, to digest the new plan of government, and to elect proper persons who were to be entrusted with the chief authority. This assembly, afterwards called the *mad parliament*, went very expeditiously to work on the business of reformation. Twenty-four barons were appointed, with supreme authority, to reform the abuses of the state; and Leicester was placed at their head. Their first step was to order four knights to be chosen out of each county, who should examine into the state of their respective constituents, and should attend at the ensuing parliament to give information of their complaints. They ordained that three sessions of parliament should be regularly held every year; that a new high sheriff should be elected annually; that no wards nor castles should be entrusted to foreigners; no new forests made, nor the revenues of any counties let to farm.

These constitutions were so just, that some of them remain to this day. But the parliament having once obtained the sovereign power, took care not to part with it again. They not only protracted the time of their sitting under various pretences; but at last had the effrontery to impose an oath upon every individual of the nation, declaring an implicit obedience to all the statutes executed or to be yet executed by the barons who were thus appointed as rulers. They not only abridged the authority of the king, but the efficacy of parliament also; giving up to 12 persons the whole parliamentary power between each session. Their usurpations were first opposed by the knights of the shire, whom they themselves had appointed. These had for some time begun to be regularly assembled in a separate house, to consider of the national grievances; the first of which was the conduct of the 24 rulers. They represented, that though the king had performed all that was required of him, the barons had hitherto done nothing on their part that showed an equal regard for the people; that their own interest and power seemed the only aim of all their decrees; and they even called upon the king's eldest son prince

England

755
Bad con-
duct of the
new rulers.

England.

Edward to interpose his authority, and save the sinking nation.

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Opposed by
prince Ed-
ward.

The prince was at this time about 22 years of age, and by his active and resolute conduct had inspired the nation with great hopes. He told those who made the application to him, that he had sworn to the late constitutions; and, on that account, though they were contrary to his own private opinions, he was resolved not to infringe them. At the same time, however, he sent a message to the barons, requiring them to bring their undertaking to an end, or otherwise to expect the most vigorous resistance to their usurpations. On this the barons were obliged to publish a new code of laws, which, though it contained scarce any thing material, yet, it was supposed, would for a while dazzle the eyes of the people, until they could take measures to establish their authority upon surer foundations. In this manner, under various pretences, they continued their power for three years; while the whole nation loudly condemned their treachery, and the Pope himself at last absolved the king and his subjects from the oath they had taken to obey their injunctions. Soon after this, a parliament was called, and the king reinstated in his former authority. The barons were obliged to submit for a time; but the Earl of Leicester having joined the Welsh, who at this time made an irruption into England, the kingdom was reduced to the most deplorable situation. The pusillanimity of the king prevented any proper or judicious method from being pursued for extricating the people from their distresses; and at last a treaty was concluded with the barons on the most disadvantageous terms that can be imagined. They were restored to the sovereignty of the kingdom, took possession of all the royal castles and fortresses, and even named the officers of the king's household. They summoned a parliament to meet at Oxford, in order more fully to settle the plan of government; and by this assembly it was enacted, that the authority of the 24 barons should continue not only during the life of king Henry, but also during that of prince Edward.

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Who is de-
feated and
taken pri-
soner, with
the king
and his bro-
ther.

These scandalous conditions would have been easily complied with by king Henry; but they were utterly rejected by prince Edward, and a civil war immediately ensued. The prince was at first successful; but, through his impetuosity, occasioned the loss of a great battle, in which his father and uncle were taken prisoners, and he himself was obliged soon after to surrender to the earl of Leicester. The king was now reduced to the most deplorable situation. His partisans were totally disarmed, while those of the earl of Leicester still kept themselves in an offensive posture. Leicester seized the estates of no fewer than 18 barons; engrossed to himself the ransom of all the prisoners; monopolized the sale of wool to foreign markets; and at last ordained that all power should be exercised by nine persons, who were to be chosen by three others, or the majority of them; and these three were the earl of Leicester himself, the Earl of Gloucester, and the bishop of Chichester.

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First House
of Com-
mons.

The miserable situation to which the kingdom was now reduced, proved at last the means of settling the government on a more proper foundation. Leicester, in order to secure himself, was obliged to have recourse to an aid, till now, entirely unknown in England, namely, that of the body of the people. He called a

England.

parliament, where, besides the barons of his own party, and several ecclesiastics who were not proper tenants of the crown, he ordered returns to be made of two knights from every shire; and also deputies from the boroughs, which had been hitherto considered as too inconsiderable to be allowed any share in the legislation. This parliament was called on the 20th of January 1265: and here we find the first outline of an English House of Commons; an institution which has ever since been considered as the bulwark of British liberty.

The new parliament was far from being so compliant to Leicester as he had desired or expected. Many of the barons who had hitherto stedfastly adhered to his party, were disgusted with his boundless ambition; and the people, who found that a change of masters was not a change from misery to happiness, began to wish for the re-establishment of royal authority. Leicester at last, to make a merit of what he could not prevent, released prince Edward from his confinement, and had him introduced at Westminster-hall, where his freedom was confirmed by the unanimous voice of the barons. But though Leicester had all the popularity of restoring the prince, he was yet politic enough to keep him guarded by his emissaries, who watched all his actions. At last, however, he found means to make his escape in the following manner. The Duke of Gloucester, being disgusted with Leicester, retired from court, and went to his estates on the borders of Wales. His antagonist pursued him thither; and to give the greater authority to his arms, carried the king and prince of Wales along with him. This furnished young Edward with the opportunity he had so long desired. Being furnished by the Earl of Gloucester with an horse of extraordinary swiftness, he took leave of his attendants, who were in fact his guards, but were not able to come up with him. They pursued him, however, for some time; but the appearance of a body of troops belonging to Gloucester soon put an end to their pursuit.

The prince no sooner recovered his liberty, than the royalists joined him from all quarters, and an army was soon procured which Leicester could not withstand. This nobleman now found himself in a remote quarter of the kingdom; surrounded by his enemies; and debarred from all communication with his friends by the river Severn, whose bridges Edward had broken down. In this extremity, he wrote to his son to hasten to his assistance from London, with a considerable army which he had under his command. With this view his son advanced to Kenilworth; but here he was surprised, and his army entirely dispersed by prince Edward. The young prince, immediately after this victory, advanced against Leicester himself; who, ignorant of the fate of his son's army, had passed the Severn in boats. He was by no means able to cope with the royalists; his men being inferior both in numbers and resolution to their antagonists. His army was defeated with great slaughter. Leicester himself was slain, though he called out for quarter, together with his eldest son Henry, and about 160 knights and other gentlemen. The old king had been purposely placed by the rebels in the front of the battle, where he was wounded, and in great danger of being killed; but, crying out, "I am Henry of Winchester your king," he was saved and put in a place of security by his son, who

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Prince Ed-
ward re-
covers his li-
berty.

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Earl of Lei-
cester de-
feated and
killed.

England.

who had flown to his assistance. The body of Leicester being found among the dead, was barbarously mangled by one Roger Mortimer; and then sent to his widow, as a testimony of the royal party's barbarity and success.

This victory, gained at Evesham, proved decisive in favour of the royal party. Almost all the castles, garrisoned by the barons, hastened to make their submissions, and opened their gates to the king. The Isle of Axholme alone, and that of Ely, trusting to the strength of their situation, ventured to make resistance; but were at last reduced, as well as the castle of Dover, by the valour and activity of prince Edward. Adam de Gourdon, a courageous baron, maintained himself some time in the forests of Hampshire, committing depredations in the neighbourhood; and obliged the prince to lead a body of troops into that country against him. Edward attacked the camp of the rebels; and being transported by the ardour of action, leaped over the trench with a few followers, and encountered Gourdon himself in single combat. The victory was long disputed between these two valiant combatants; but ended at last in the prince's favour, who wounded his antagonist, threw him from his horse, and took him prisoner. He not only granted him his life; but introduced him that very night to the queen at Guildford, procured her pardon, and was ever after faithfully served by him.

In 1271, prince Edward, having settled the affairs of the kingdom, undertook an expedition to the Holy Land, where he signalized himself by many acts of valour. The king's health declined visibly after the departure of his son; and at last, worn out with cares and the infirmities of age, he expired at St Edmonsbury on the 16th of November 1272, in the 64th year of his age and the 56th of his reign.

Prince Edward had reached Sicily in his return from the Holy Land, when he received an account of his father's death; at which he expressed much concern. As he knew that England was at that time in a state of perfect tranquillity, he was in no haste to return, but spent near a year in France before he made his appearance in England. He was received by his subjects with the utmost joy, and crowned at Westminster by Robert archbishop of Canterbury on the 19th of August 1274. He immediately applied himself to the correcting of those disorders which the civil commotions, and weak administration of his father, had introduced. A system of strict justice, bordering on severity, was introduced and kept up thro' the whole of this reign. The Jews were the only part of his subjects whom Edward oppressed. Many arbitrary taxes were levied upon them; 280 of them were hanged at once for adulterating the coin; the goods of the rest were confiscated, and all of them banished the kingdom.

In 1276, the king undertook an expedition against Llewellyn prince of Wales, who had refused to do homage for his crown. The conquest of that country was not fully accomplished till the year 1283; after which the principality of Wales was annexed to the crown of England, and thenceforth gave a title to the king's eldest son. *—In 1286, the settlement of Wales appeared so complete, that the king went abroad in order to make peace between Alfonso king of Arra-

gon and Philip le Bel king of France, who had a difference about the kingdom of Sicily. He succeeded in his negotiations; but, staying abroad three years, he found that many disorders had been introduced in his absence. Many instances of robbery and violence had broke out in all parts of England; but the corruption of the judges, by which the fountains of justice were poisoned, was of still more dangerous consequence. Edward, in order to remedy this prevailing abuse, summoned a parliament, and brought the judges to a trial; where all of them except two, who were clergymen, were convicted of this flagrant iniquity, were fined, and deposed from their office. The amount of the fines levied upon them is of itself a sufficient proof of their guilt, being above 100,000 marks; an immense sum in those days, sufficient to defray the expences of a war betwixt two great nations. The king afterwards made all the new judges swear that they would take no bribes; but the depositing and fining the old ones was the more effectual remedy.

In 1291, king Edward began to meditate the conquest of Scotland, which employed him during the rest of his life; but which, though that kingdom was by him reduced to the greatest distress, he was never able to accomplish *. At the same time, he was engaged in expensive contests with France; and these multiplied wars and preparations for war, by obliging him to have frequent recourse to parliamentary supplies, became the remote causes of great and important changes in the government. The parliament was modelled into the form which has continued ever since. As a great part of the property of the kingdom, by the introduction of commerce and improvements in agriculture, was transferred from the barons to the lower class of people, so their consent was thought necessary for raising the supplies. For this reason, the king issued writs to the sheriffs, enjoining them to send to parliament, along with two knights of the shire, two deputies from each borough within their county; and these provided with sufficient powers from their constituents to grant such demands as they should think reasonable for the safety of the state. The charges of these deputies were to be borne by the boroughs which sent them; and so far were they from considering this deputation as an honour, that nothing could be more displeasing to any borough than to be thus obliged to send a deputy, or to any individual than to be thus chosen. The authority of these commons, however, increased through time. Their union gave them weight; and it became customary among them, in return for the supplies which they granted, to prefer petitions to the crown for the redress of those grievances under which the nation was supposed to labour. The more the king's necessities increased, the more he found it necessary to give them an early redress; till, from requesting, the commons proceeded to requiring; and having all the property of the nation, they by degrees began also to be possessed of the power.

Edward I. died of a dysentery at Carlisle on the 7th of July 1307, as he was leading a great army into Scotland, against the inhabitants of which he had vowed the most dreadful vengeance. He was succeeded by his son Edward II. whom he had charged with his dying breath to prosecute the war against Scotland, and never to desist till he had finally subdued the

England.

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Attempts
the con-
quest of
Scotland.

* See Scot-
land.

165
New ma-
dels the
parlia-
ment.

166
Dies, and is
succeeded
by Edw. II.

England.

161
Death of
Henry III.

162
Edward I.

163
Conquers
Wales.

* See Wales.

England. kingdom. But the new king was of a very different disposition from his father. The Scots gradually recovered their power; and in 1314 gave the English such a terrible defeat at Bannockburn, that for many years no superiority of numbers could encourage them to look the Scots in the face. See SCOTLAND.

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Discontents
of his sub-
jects.

The reign of Edward II. affords no particulars of great moment. Being a prince of a weak underling, though endowed with no remarkable bad qualities, his reign was one continued series of quarrels with his turbulent subjects. His favourites were the most general causes of discontent. The first of these was one Piers Gaveston, the son of a Gascon knight of some distinction, who had honourably served the late king, and who, in reward for his services, had obtained an establishment for his son in the family of the prince of Wales.—To be the favourite of any king whatever, is no doubt in itself a sufficient offence to the rest of the courtiers. Numberless faults were therefore found with Gaveston by the English barons. When the king went over to France to espouse the princess Isabella, to whom he had been long contracted, Gaveston was left guardian of the realm, with more ample powers than had usually been conferred in such a case. But when the queen, who was of an imperious and intriguing spirit, arrived, Gaveston had the misfortune to fall under her displeasure also, on account of the ascendancy he had acquired over the king. A conspiracy was therefore soon formed against the favourite; at the head of which were, the queen, and the Earl of Lancaster cousin-german to the king, and the most opulent and powerful nobleman in England. The king, unable to resist such a combination, was at last obliged to banish Gaveston; but recalled him some time after. This was sufficient to spread an alarm over the whole kingdom: a civil war ensued; and the nobility having got Gaveston into their hands, soon freed themselves of any farther apprehensions from him, by putting him to death.

After the unfortunate defeat at Bannockburn, king Edward chose a new favourite named *Hugh Le Despenser*. He was a young man of a noble English family; some merit, and very engaging accomplishments. His father was a person of a much more respectable character than the son; but the being admitted to a share of king Edward's favour was a sufficient crime. The king imprudently dispossessed some lords of their estates, in order to bestow them upon this favourite; and this was a sufficient pretence for openly attacking both the father and son. The Earls of Lancaster and Hereford flew to arms. Sentence was procured from parliament of perpetual exile against the two Spensers, with a forfeiture of all their estates. At last the king took the field at the head of 30,000 men, and pressed the Earl of Lancaster so closely, that he had not time to collect his forces together; and, flying from one place to another, he was at last stopped in his way towards Scotland, and made prisoner. He was immediately condemned by a court-martial; and executed on an eminence near Pomfret, with circumstances of the greatest indignity.

Spenser now triumphed for some time over his enemies; most of the forfeitures were seized for his use,

and he is said to have been guilty of many acts of rapine and injustice. But he was soon opposed by a more formidable enemy. Queen Isabella fled to France, and refused to return to England till Spenser was removed from the royal presence, and banished the kingdom. Thus she made herself popular in England, where Spenser was universally disliked; and she had the pleasure of enjoying the company of a young nobleman named *Mortimer*, upon whom she had lately placed her affections. The queen's court, therefore, became a sanctuary for all the malecontents who were banished their own country, or who chose to come over. When she thought matters were ripe for her purpose, she set sail from Dort harbour, accompanied by 3000 armed men. She landed without opposition on the coast of Suffolk, on the 24th of September 1326; and she no sooner appeared, than there seemed to be a general revolt in her favour. The unfortunate king found the spirit of dissuality spread over the whole kingdom. He had placed some dependence on the garrison of Bristol, which was under the command of the elder Spenser: but they mutinied against their governor; and that unfortunate favourite was delivered up, and condemned by the tumultuous barons to the most ignominious death. He was hanged on a gibbet in his armour; his body was cut in pieces and thrown to the dogs; and his head was sent to Winchester, where it was set on a pole, and exposed to the insults of the populace. Young Spenser did not long survive his father. He was taken, with some others who had followed the fortunes of the wretched king, in an obscure convent in Wales. The queen had not patience to wait the formality of a trial; but ordered him to be immediately led forth before the insulting populace, and seemed to take a savage pleasure in beholding his distress. He was executed on a gibbet 50 feet high; his head was sent to London, where it was received by the citizens with brutal triumph, and fixed on the bridge.

In the mean time the king, who hoped to find refuge in Wales, was quickly discovered, and delivered up to his adversaries, who insulted him in the grossest manner. He was conducted to the capital amidst the insults and reproaches of the people, and confined in the tower. A charge was soon exhibited against him; in which no other crimes but his incapacity to govern, his indolence, his love of pleasure, and his being swayed by evil counsellors, were objected against him. His deposition, however, was quickly voted by parliament; he was assigned a pension for his support; his son Edward, a youth of 14, was chosen to succeed him, and the queen was appointed regent during the minority. The deposed monarch did not long survive the loss of his crown. He was at first consigned to the custody of the Earl of Lancaster; but this nobleman showing some marks of respect and pity, he was taken out of his hands, and delivered over to the lords Berkeley, Mautravers, and Gournay, who were entrusted alternately, each for a month, with the charge of guarding him. While he was in Berkeley's custody, he was still used with some degree of humanity; but when the turn of Mautravers and Gournay came, every species of indignity was practised upon him, as if they had designed to accelerate his death by the bitterness of his sufferings. It is reported, that one day when

E.g'land.
168
Insurrec-
tion against
the queen.

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Edward de-
posed;

Ed.

England. Edward was to be shaved, they ordered cold and dirty water to be brought from a ditch for that purpose; and when he desired it to be changed, and was still denied his request, he burst into tears and exclaimed, That in spite of their insolence he would be shaved with clean and warm water. As his persecutors, however, saw that his death might not arrive, even under every cruelty they could practise, and were daily afraid of a revolution in his favour, they determined to rid themselves of their fears by destroying him at once. Mortimer, therefore, secretly gave orders to the two keepers, who were at his devotion, instantly to dispatch the king; and these ruffians contrived to make the manner of his death as cruel and barbarous as possible. Taking advantage of Berkeley's sickness, in whose custody he then was, and who was thereby incapacitated from attending his charge, they came to Berkeley-castle, and put themselves in possession of the king's person. They threw him on a bed, and held him down with a table which they had placed over him. They then ran a horn pipe up his body, through which they conveyed a red-hot iron; and thus burnt his bowels without disfiguring his body. By this infernal contrivance they expected to have their crime concealed; but the horrid shrieks of the king, which were heard at a distance from the castle, gave a suspicion of the murder; and the whole was soon after divulged by the confession of one of the accomplices. Gournay and Mautravers were held in detestation by all mankind; and when the ensuing revolution deprived their protectors of power, they found it necessary to fly the kingdom. Gournay was afterwards seized at Marseilles, delivered over to the feudalist of Guienne, and put on board a ship with a view of carrying him over to England; but he was beheaded at sea, by secret orders, as was supposed, of some nobles and prelates in England, anxious to prevent any discovery which he might make of his accomplices. Mautravers concealed himself for some years in Germany; but having found means of rendering some services to Edward III. he ventured to approach his person, threw himself on his knees before him, and received a pardon.

1731
Sovereign power obtained by the queen and Mortimer.
By the death of Edward II. the government fell entirely into the hands of the queen and her paramour Mortimer. The parliament, which raised young Edward to the throne, had indeed appointed 12 persons as his privy-council, to direct the operations of government. Mortimer excluded himself, under a show of moderation; but at the same time secretly influenced all the measures that came under their deliberation. As this influence began very soon to be perceived, and the queen's criminal attachment to Mortimer was universally known, these governors soon became very obnoxious to the people. The first stroke given to Mortimer's power was during an irruption of the Scots, when the favourite prevented the young king from attacking the enemy. Though it is very probable that the English army would have been deluged by making an attack on an army situated in such an advantageous post as the Scots at that time occupied, Mortimer incurred great blame on that account. He was accused of having allowed the Scots to make their escape; and the general disgust on this account was increased by his concluding a peace with that kingdom,

wherein the English renounced all title to the sovereignty of Scotland for the sum of 30,000 marks. Soon after Mortimer seized and executed the earl of Kent, brother to the late king; who, supposing Edward II. to be still alive, had formed a design of reinstating him in his kingdom. The execution was so sudden, that the young king had not time even to interpose in his behalf; and Mortimer soon after seized this nobleman's estate for his own use, as he did also the immense fortunes of the Spencers.

Edward, finding the power of Mortimer a continual restraint upon himself, resolved to shake off an authority that was likewise grown odious to the whole nation. The queen and Mortimer had for some time chosen the castle of Nottingham for their residence. It was strictly guarded, the gates were locked every night, and the keys carried to the queen. It was therefore agreed between the king and some of the barons, who secretly entered into his designs, to seize upon them in this fortress. Sir William Leland the governor was induced to admit them through a subterraneous passage, which had been formerly contrived for an outlet, but was now choked up with rubbish, and known only to one or two. Through this passage the noblemen in the king's interest entered the castle in the night-time; and Mortimer, without having it in his power to make any resistance, was seized in an apartment adjoining to that of the queen. The parliament, which was then sitting, condemned him, without either permitting him to make his defence, or examining a single witness against him. He was hanged on a gibbet at a place called *Elmes*, about a mile from London. A similar sentence was passed against some of his adherents, particularly Gournay and Mautravers, who found an opportunity of escaping as above mentioned. The queen, who was perhaps the most culpable of the whole, was screened by the dignity of her station. She was, however, deposed from all share of power; and confined for life to the castle of Rising, with a pension of 3000 pounds a year. From this confinement she was never set free, though the king paid her an annual visit of ceremony. She lived 25 years after her deposition.

Edward III. proved the greatest warrior that ever sat on the English throne. He first attempted to raise Edward Baliol to the sovereignty of Scotland; but this he found impossible fully to accomplish. Edward next formed a project of invading and conquering France, to the sovereignty of which he pretended a successful right. His first expectations were attended with so little success, that on his return to England he found the nation very much discontented, and himself harassed by his numerous creditors without any sufficient resource for paying them. Being determined, however, not to bear any blame himself if he could throw it any where else, he took the first opportunity of wreaking his vengeance upon his subjects. Finding therefore the tower of London negligently guarded on his arrival, he imprisoned the constable and all his inferior officers, treating them with the greatest severity. He then fell upon the sheriffs and collectors of the revenue, whom he dismissed from their employments, and appointed an inquiry into their conduct to be made by persons who, knowing the king's humour, were sure to find every one guilty who came before them. The keepers of the privy-seal, the chief-justice, the mayor of London,

England.

Mortimer executed.

1732
Edward invades France unsuccessfully.1734
Edward's arbitrary behaviour on his return.

England.

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Is opposed
by the
archbishop
of Canter-
bury;

the bishops of Chichester and Litchfield, with the chancellor and treasurer, were deposed and imprisoned. In this career of repentment and cruelty, however, he found himself opposed by the archbishop of Canterbury, whom he had appointed to collect the taxes laid on for the support of the French war. That prelate happening to be absent at the time of the king's arrival, did not immediately feel the effects of his repentment. Being informed, however, of the humour in which his sovereign was, he issued a sentence of excommunication against all who, on any pretence whatever, should exercise violence against the persons or estates of clergymen, or who infringed those privileges secured by the great charter, or who accused a prelate of treason, or any other crime, in order to bring him under the king's displeasure. A regular combination was formed against the king by the clergy, with the primate at their head; who, to execute the indignation of the people as much as possible, reported, that the king intended to recall the general pardon and the remission to old debts which had been granted, and to impose new and arbitrary taxes without consent of parliament. The archbishop also, in a letter to the king, informed him, that there were two powers by which the world was governed, viz. the holy pontifical apostolical dignity and the regal authority; of which the clerical power was evidently the supreme, as the priests were to answer even for the conduct of kings at the last judgment; and were besides the spiritual fathers of all the faithful, kings and princes not excepted; having, besides, a heavenly charter, intitling them to direct their wills and actions, and to censure their transgressions. On this the king resolved to mortify him, by sending no summons to him when the parliament was called: but the prelate, undaunted by this mark of repentment, appeared before the gates of the parliament-house with his crozier in his hand, demanding admittance as the first peer of the realm. This application was rejected for two days, but at last complied with; and the parliament now seemed inclined to abridge the king's authority considerably. They began with observing, that as the great charter had been violated in many points, particularly by the illegal imprisonment of many freemen and the seizure of their goods, it was necessary to confirm it anew, and to oblige all the chief officers of the law and others to swear to the observance of it. It was also required, that whenever any of the great offices became vacant, the king should fill them up by the advice of his council and the consent of such barons as should at the time be found to reside in the neighbourhood of the court. They enacted also, that on the third day of every session the king should resume all such offices into his own hand, excepting those of the justices of the two benches and the barons of exchequer; that the ministers should for the time be reduced to private persons; that they should in that condition answer before parliament to any accusation preferred against them; and that, if they were found in any respect guilty, they should be finally deprived of their offices, and others appointed in their stead. In return for such ample concessions, the king was offered a grant of 20,000 sacks of wool; and such was his urgent necessity, that he was compelled to accept of it even upon these terms. Still, however,

he determined to adhere to his engagements no longer than till this necessity was removed. Though the agreement therefore was ratified in full parliament, he secretly entered a protest, that, as soon as his convenience permitted, he would from his own authority revoke what had been extorted from him. This protest was afterwards confirmed by a public edict; in which he asserted, that that statute had been made contrary to law; that it was prejudicial to the prerogatives of the crown, which he had only dissembled when he seemed to ratify it; and that in his own breast he had never assented to it; and declared, that from thenceforth it had no force or authority. This exertion of arbitrary power, which it might have been imagined would have occasioned a prodigious clamour, was not taken notice of by any of the subsequent parliaments; so that in the course of two years Edward had entirely regained his authority, and obtained a repeal of the obnoxious statute just mentioned. Having thus settled matters to his satisfaction, the king resumed his expedition against France, where he gained great advantages. In his absence the Scots invaded England; but were entirely defeated at Durlham, and their king himself taken prisoner. The English king in the mean time continued his victories on the continent; in which he was greatly assisted by Edward surnamed the *Black Prince*, the greatest hero recorded in the English annals. But for the wars of Edward III. and the exploits of this famous prince, see the articles SCOTLAND and FRANCE. The *Black Prince* died on the 8th of June 1376, and the king survived only about a year. He expired on the 21st of June 1377, and was succeeded by his second son Richard.

England.

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But regains
his power.

178
Performs
his great ex-
ploits in
France.

179
Richard II.

As the new king was only eleven years old when he ascended the throne, the government was vested in the hands of his three uncles the dukes of Lancaster, York, and Gloucester. The different dispositions of these noblemen, it was thought, would cause them check the designs of each other. Lancaster was neither popular nor enterprising; York was indolent and weak; and Gloucester turbulent, popular, and ambitious. Discontents first arose among the common people. They had now acquired a share of liberty sufficient to inspire them with a desire for more, and this desire was greatly increased by the discourses of one John Ball a sedition preacher. He went about the country, and inculcated on his audience, that mankind were all derived from one common stock; and that all of them had equal right to liberty and the goods of nature, of which they had been deprived by the ambition of a few insolent rulers.

These doctrines were greedily swallowed by the populace, who were farther inflamed by a new imposition of three groats a-head upon every person in the kingdom above 15 years of age. This had been granted as a supply by parliament, and was no doubt necessary on account of the many expensive wars in which the kingdom was engaged; but its apparent injustice, in laying no more burden upon the rich than the poor, excited the utmost resentment of the people. The manner, too, of collecting this tax, soon furnished them with an occasion of revolt. It began in Essex, where a report was industriously spread that the peasants were to be destroyed, their houses burned, and their farms plundered. A blacksmith, well known by the name

of

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And oblige
at last
to submit.

England
180
Dangerous
insurrec-
tion by
Wat Ty-
ler.

of *Wat Tyler*, was the first that excited them to arms. The tax-gatherers coming to this man's house while he was at work, demanded payment for his daughter. This he refused, alleging that she was under the age mentioned in the act. One of these fellows offered to produce a very indecent proof to the contrary, and at the same time laid hold of the maid. This the father resenting, immediately knocked out the ruffian's brains with his hammer. The bystanders applauded the action; and exclaimed that it was high time for the people to take vengeance on their tyrants, and to vindicate their native liberty. The whole country immediately took arms, and the insurgents soon amounted to about 100,000 men. They advanced to Blackheath, where they sent a message to the king, who had taken shelter in the tower, desiring a conference with him. The king was desirous of complying with their demands, but was intimidated by their fierce behaviour. In the mean time they entered the city, burning and plundering the houses of such as were obnoxious for their power or riches. Their animosity was particularly levelled against the lawyers, to whom they showed no mercy. The king at last, knowing that the tower was not able to resist their assaults, went out among them, and desired to know their demands. To this they made a very humble remonstrance; requiring a general pardon, the abolition of slavery, freedom of commerce in the market-towns, and a fixed rent instead of those services required by the tenure of villenage. The king granted all these requests; and charters were made out by which the grant was ratified. In the mean time, however, another body of these insurgents had broke into the tower, and murdered the chancellor, the primate, and the treasurer, with some other officers of distinction. They then divided themselves into bodies, and took up their quarters in different parts of the city. At the head of one of these was *Wat Tyler*, who led his men into Smithfield, where he was met by the king, who invited him to a conference under pretence of hearing and redressing his grievances. *Tyler* ordered his companions to retire till he should give them a signal, and boldly ventured to begin a conference with the king in the midst of his retinue. His demands were, That all slaves should be set free; that all commonages should be open to the poor as well as to the rich; and that a general pardon should be passed for the late outrages. Whilst he made these demands, he now and then lifted up his sword in a menacing manner: which insolence so raised the indignation of *William Walworth* lord mayor of London, that, without considering the danger to which he exposed his majesty, he stunned *Tyler* with a blow of his mace; while one of the king's knights riding up, dispatched him with his sword. The mutineers, seeing their leader fall, prepared themselves to take revenge. Their bows were already bent for execution; when *Richard*, though not yet 16 years of age, rode up to the rebels, and with admirable presence of mind cried out: "What, my people, will you kill your king? Be not concerned for the loss of your leader. I myself will now be your general. Follow me into the field, and you shall have whatever you desire." The multitude immediately desisted, and followed the king into the fields, where he granted them the same charters that he had before granted to their compa-

nions. These charters, however, were soon after revoked, and the common people reduced to the same situation in which they had formerly been.

The courage, address, and presence of mind, which the king had discovered in quelling such a dangerous tumult, gave great hopes to the nation: but, in proportion as *Richard* advanced in years, these hopes were blasted; and his want of capacity, or at least of solid judgment, appeared in every enterprise he attempted. The king had unluckily lost the favour of the common people after the insurrection just mentioned. He allowed the parliament to revoke the charters of enfranchisement and pardon which had been granted; some of the ringleaders in the late disorders had been severely punished, and some even put to death without any form of process or trial. Thus the popular leaders were greatly exasperated by this cruelty, though probably the king did not follow the dictates of his own mind so much in it as the advice of his counsellors. But having thus lost the favour of one party, he quickly after fell under the displeasure of the other also. Supposing himself to be in too great subjection to his uncles, particularly the Duke of Gloucester, he attempted to shake off the yoke, by raising others to such a degree of power as might enable them to rival them. His first favourite was *Robert de Vere* Earl of Oxford, a young man of an agreeable person, but dissolute in his behaviour, who soon acquired an absolute ascendancy over him. So much was he determined to show his attachment to this nobleman, that he first created him Marquis of Dublin, a title never known in England before; then Duke of Ireland; transferring to him the entire sovereignty of that island by patent for life. He gave him in marriage his cousin-german, the daughter of the Earl of Bedford; but soon after permitted him to divorce her for another lady with whom he had fallen in love. This nobleman soon became the dispenser of all the king's favours to such a degree, that a conspiracy was formed against him. At the head of which were, *Mowbray* Earl of Nottingham, *Fitz Alan* Earl of Arundel, *Percy* Earl of Northumberland, *Montacute* Earl of Salisbury, and *Beauchamp* Earl of Warwick. *Vere* was impeached in parliament; and tho' nothing of moment was even alleged against him, he was condemned and deprived of his office. They next proceeded to attack the royal authority itself. Under pretence that the king was yet unable to govern the kingdom, though at that time 21 years of age, they appointed a commission of 14 persons to whom the sovereignty was to be transferred for a year. This measure was driven forward by the duke of Gloucester, and none but his own faction were admitted as members of the committee. The king could not without regret perceive himself thus totally deprived of authority. He first endeavoured to gain over the parliament to his interests, by influencing the sheriffs of each county, who were then the only returning officers. This measure failing, he next applied to the judges. They declared, that the commission which had deprived the king of his authority was unlawful, and that those who procured or advised it were punishable with death. Their sentence was quickly opposed by declarations from the lords. The Duke of Gloucester armed his partisans; and appeared at Haringay park near

England

182
The king
loses the
favour of
the people.

183
His excec-
sive favour
for the Earl
of Oxford.

184
A conspi-
racy against
the king.

185
He is kill-
ed.

Higbgate,

England.

Highgate, at the head of a body of men sufficient to intimidate the king and all his adherents. These infuriated, sensible of their own power, began by demanding of the king the names of those who had advised him to his late rash measures. A few days afterwards they appeared armed in his presence, and accused by name the Archbishop of York, the Duke of Ireland, the Earl of Suffolk, and Sir Robert Tresilian, one of the judges who had declared in his favour, together with Sir Nicholas Bamber, as public and dangerous enemies to the state. The Duke of Ireland fled into Cheshire, where he attempted to raise a body of forces; but was quickly obliged to fly into Flanders, on the arrival of the Duke of Gloucester with a superior army. Soon after, the king was obliged to summon a parliament, where an accusation was drawn up against five of his counsellors. Of these only Sir Nicholas Bamber was present; and he was quickly found guilty, condemned, and executed, together with Sir Robert Tresilian, who had been discovered and taken during the interval. Lord Beauchamp of Holt was soon after condemned and executed; and Sir Simon Burley, who had been appointed the king's governor, shared the same fate, though the queen continued for three hours on her knees before the Duke of Gloucester, imploring his pardon.

Such unparalleled insolence and barbarity in a subject could not go unpunished. In 1389, the king, at an extraordinary council of the nobility assembled after Easter, to the astonishment of all present, desired to know his age. Being told that he was turned of two and twenty, he alleged that it was then time for him to govern without help; and that there was no reason why he should be deprived of those rights which the meanest of his subjects enjoyed. The lords answered in some confusion, that he had certainly an undisputed right to take upon himself the government of the kingdom. "Yes (replied the king), I have long been under the government of tutors; and I will now first show my right to power by their removal." He then ordered Thomas Arundel, whom the commissioners had lately appointed chancellor, to give up the seals; which he next day delivered to William Wickham bishop of Winchester. He next removed the Duke of Gloucester, the Earl of Warwick, and other lords of the opposition, from the council; and all the great officers of the household, as well as the judges, were changed.

The king being thus left at liberty to govern as he thought proper, for some time behaved in such a manner as to gain the affections of the people. It does not appear indeed that he ever gave much cause of complaint; but it was impossible for any prince in those days to keep himself secure on the throne but by a very severe and vigorous administration. The Duke of Gloucester, perceiving that Richard was not of a warlike disposition, frequently spoke with contempt of his person and government, and deliberated concerning the lawfulness of throwing off all allegiance to him. The king being informed of his conduct by spies appointed for that purpose, at last formed a resolution of ridding himself of Gloucester and his faction at once. He therefore ordered that nobleman to be immediately arrested and sent over to Calais, where there was no danger of his being rescued by his numerous adherents. The

earls of Arundel and Warwick were seized at the same time; and a new parliament, which the king knew would be perfectly obedient to his will, was summoned to Westminster. Here the commission of 14, who had usurped on the royal authority, was annulled for ever; all those acts which had condemned his former ministers were repealed; and the general pardon which the king had formerly given when he assumed the government into his own hands, was revoked. Several of Gloucester's party were condemned and executed, and at last that nobleman himself was called for to take his trial as well as the rest; but he had before been privately dispatched in prison.

After the destruction of the Duke of Gloucester and the heads of his party, a misunderstanding arose among the noblemen who had joined in the prosecution. The Duke of Hereford appeared in parliament, and accused the Duke of Norfolk of having spoken seditious words against his majesty in a private conversation. Norfolk denied the charge, gave Hereford the lie, and offered to prove his innocence by single combat. The challenge was accepted; but on the day appointed for the duel, the king would not suffer the combatants to engage, but commanded both of them to leave the kingdom. The Duke of Norfolk he banished for life, but the Duke of Hereford only for ten years. The former retired to Venice, where in a short time he died of a broken heart. Hereford behaved in a resigned and submissive manner; which so pleased the king, that he consented to shorten the time of his banishment four years; he also granted him letters patent, ensuring him of the enjoyment of any inheritance which should fall to him during his absence; but upon the death of his father the Duke of Lancaster, which happened shortly after, Richard revoked those letters, and kept the estate to himself.

This last injury inflamed the resentment of Hereford to such a degree, that he formed a design of dethroning the king. He was a great favourite both with the army and people; he was immensely rich, and connected by blood or alliance with all the great families of the nation. The king at the same time, it is said, gave himself up to an idle, effeminate life; and his ministers following his example, the national honour was lost. The number of malecontents daily increased, and only waited for the absence of the king, in order to put their schemes in execution; and this opportunity soon offered.

The Earl of March, presumptive heir to the crown, having been appointed the king's lieutenant in Ireland, was slain in a skirmish with the natives of that country; which so incensed Richard, that, unmindful of his precarious situation at home, he went over to Ireland with a considerable army, in order to revenge his death in person. The Duke of Lancaster (for that was the title which Hereford assumed on the death of his father) hearing of the king's absence, instantly embarked at Nantz; and with a retinue only of 60 persons in three small vessels, landed at Ravenspur in Yorkshire. The Earl of Northumberland, who had long been a malecontent, together with Henry Percy his son, who from his ardent valour was surnamed *Hotspur*, immediately joined him with their forces; and the people flocked to him in such numbers, that in a few days his army amounted to 60,000 men.

Richard,

185
The king takes the power into his own hands.

England.

186
Duke of Gloucester murdered.

187
Duke of Hereford and Norfolk banished.

188
Hereford forms a scheme of dethroning the king.

England.

Richard, in the mean time, continued in perfect security in Ireland for some time. Contrary winds for three weeks together prevented his receiving any news of the rebellion which was begun in his native dominions. He landed therefore at Milford Haven without suspicion, attended by a body of 20,000 men; but immediately found himself opposed by a power which he could by no means resist. His army gradually deserted him, till at last he was obliged to acquaint the duke, that he would submit to whatever terms he pleased to prescribe. The duke did not think proper to enter into any treaty with the king; but carried him to London, where he was confined close prisoner in the Tower, formally deposed by parliament, or rather by the Duke of Lancaster, and at last put to death. The manner of his death is variously related. According to some, eight or nine ruffians were sent to the castle of Pomfret, whither the unhappy prince had been removed, in order to dispatch him. They rushed unexpectedly into his apartment; but Richard, knowing their design, resolved to sell his life as dear as possible. He wrested a pole-axe from one of the murderers, with which he killed four of them; but was at length overpowered and killed. Others relate that he was starved in prison; and that, after he was denied all nourishment, he prolonged his life 14 days, by feeding on the flocks of his bed. He died in the year 1399, in the 34th year of his age, and 23d of his reign.—It was during the reign of Richard II. that Wickliff, the noted reformer, published his doctrines in England. See WICKLIFF.

189
Richard deposed and murdered.

190
Duke of Lancaster's claim to the crown.

After sentence of deposition had been pronounced on Richard by both houses of parliament, the throne being then vacant, the Duke of Lancaster stepped forth; and having crossed himself on the forehead and on the breast, and called on the name of Christ, gave in his claim to the throne in the following words, which we shall give in the original language. "In the name of Father, Son, and Holy Ghost, I Henry of Lancaster, challenge this rewme of Ynglond, and the crown, with all the membres and the appurtenances; als I that am defendit by right line of the blode, coming from the gude King Henry therde, and throge that right that God of his grace hath sent me, with help of kyn, and of my frendes to recover it; the which rewme was in poynt to be ondene by default of governance, and ondoynge of the gude laws."

The right which the duke here claimed by descent from Henry III. proceeded on a false story that Edmund Earl of Lancaster, son of Henry III. was really the elder brother of Edward I.; but that, by reason of some deformity in his person, he had been postponed in the succession, and Edward the younger brother imposed on the nation in his stead. The present Duke of Lancaster inherited from Edmund, by his mother, the right which he now pretended to the crown; though the falsehood of the story was so generally known, that he thought proper to mention it only in general terms.—No opposition, however, was made to the validity of this title in parliament; and thus commenced the differences between the houses of York and Lancaster, which were not terminated but by many bloody and ruinous wars.

191
Henry IV.

The reign of Henry IV. was little else than a continued series of insurrections. In the very first parliament he called, no fewer than 40 challenges were given and accepted by different barons; and though Henry had ability and address enough to prevent these duels from being fought, it was not in his power to prevent continual insurrections and combinations against himself. The most formidable one was conducted by the Earl of Northumberland, and commenced A. D. 1402. The occasion of it was, that Henry denied the Earl liberty to ransom some Scots prisoners which had been taken in a skirmish with that nation. The king was desirous of detaining them in order to increase his demands upon Scotland in making peace; but as the ransom of prisoners was in that age looked upon as a right belonging to those who had taken them, the earl thought himself grievously injured. The injury appeared still the greater, because Northumberland considered the king as indebted to him both for his life and crown. He resolved therefore to dethrone Henry; and to raise to the throne young Mortimer, who was the true heir to the crown, as being the son of Roger Mortimer Earl of March, whom Richard II. had declared his successor. For this purpose he entered into an alliance with the Scots and Welsh, who were to make an irruption into England at the same time that he himself was to raise what forces he could in order to join them. But when all things were prepared for this insurrection, the Earl found himself unable to lead on the troops, by a sudden fit of illness with which he was seized at Berwick. On this, young Percy (surnamed *Hospur*) took the command; and marched towards Shrewsbury, in order to join the Welsh. But the king had happily a small army with which he intended to have acted against the Scots; and knowing the importance of celerity in civil wars, instantly hurried down, that he might give battle to the rebels. He approached Shrewsbury before a junction with the Welsh could be effected; and the impatience of Percy urged him to an engagement, which at that time he ought to have declined. The evening before the battle, he sent a manifesto to Henry; in which he renounced his allegiance, set the king at defiance, and enumerated all the grievances of which he imagined the nation might justly complain. He reproached him (and very justly) with his perjury; for Henry, on his first landing in England, had sworn upon the gospels, before the Earl of Northumberland, that he had no other intention but to recover possession of the duchy of Lancaster, and that he would ever remain a faithful subject to King Richard. He aggravated his guilt, in first dethroning and then murdering that prince; and in usurping on the title of the house of Mortimer; to whom, both by lineal succession and by declarations of parliament, the throne, then vacant by Richard's death, did of right belong. Several other heavy charges were brought against him; which, at that time, could be productive of no other effect than to irritate the king and his adherents to the utmost.

The armies on each side were in number about 12,000; so that they were not unmanageable by their commanders; and as both leaders were men of known bravery, an obstinate engagement was expected. The battle was fought on the 20th of July 1403; and we can scarce find in those ages any other in which the shock was so terrible and constant. At last Percy being killed by an unknown hand, the victory was decided

England.

192
Insurrection of the Earl of Northumberland.

193
His son defeated and killed at Shrewsbury.

England.

cided in favour of the royalists. There are said to have fallen on that day near 2300 gentlemen, and 6000 private men, of whom near two thirds were of Percy's army.

The Earl of Northumberland having recovered from his sickness, and levied an army, was on his march to join his son; but being opposed by the Earl of Westmorland, and hearing of the defeat at Shrewsbury, he dismissed his forces, and came with a small retinue to the king at York. He pretended that his sole intention was to mediate between the contending parties; and the king thought proper to accept of his apology, and grant him a pardon for his offence. The other rebels were treated with equal lenity; and none of them, except the Earl of Worcester and Sir Richard Vernon, who were regarded as the chief authors of the insurrection, perished by the hands of the executioner. This lenity, however, was not sufficient to keep the kingdom quiet; one insurrection followed another almost during the whole of this reign; but either through Henry's vigilance, or the bad management of the conspirators, they never could unite their forces in such a manner as was necessary for bringing their projects to bear.

194
Archbishop
of York ex-
ecuted.

This reign is remarkable for the first capital punishment inflicted on a clergyman of high rank. The Archbishop of York having been concerned in an insurrection against the king, and happening to be taken prisoner, was beheaded without either indictment, trial, or defence; nor was any disturbance occasioned by this summary execution. But the most remarkable transgression of this reign was, the introduction of that absurd and cruel practice of burning people on account of their religion. Henry, while a subject, was thought to have been very favourable to the doctrines of Wickliffe; but when he came to the throne, finding his possession of it very insecure, he thought superstition a necessary implement of his authority, and therefore determined by all means to pay court to the clergy. There were hitherto no penal laws against heresy; not indeed through the toleration of the court of Rome, but through the stupidity of the people, who could not perceive the absurdities of the established religion. But when the learning and genius of Wickliffe had once broken the fetters of prejudice, the ecclesiastics called aloud for the punishment of his disciples; and Henry, who was very little scrupulous in his conduct, resolved to gratify them. He engaged parliament to pass a law for this purpose: it was enacted, that when any heretic, who relapsed, or refused to abjure his opinions, was delivered over to the secular arm by the bishop or his commissaries, he should be committed to the flames before the whole people. This weapon did not remain long unemployed in the hands of the clergy. William Sautré, rector of St Olithes in London, had been condemned by the convocation of Canterbury; his sentence was ratified by the house of Peers; the king issued his writ for the execution; and the unhappy man was burnt alive in the year 1401. The doctrines of Wickliffe, however, seem to have already gained ground very considerably in England. In 1405, the commons, who had been required to grant supplies, proposed in plain terms to the king to seize all the temporalities of the church, and employ them as a perpetual fund to serve the exigencies of the state. They insisted that

195
Burning of
heretics in-
sroduced.

the clergy possessed a third of the lands of the kingdom; and they contributed nothing to the public burdens; and that their exorbitant riches tended only to disqualify them from performing their ministerial functions with proper zeal and attention. When this address was presented, the Archbishop of Canterbury, who then attended the king, objected that the clergy, though they went not in person to the wars, sent their vassals and tenants in all cases of necessity; while at the same time, they themselves who staid at home were employed night and day in offering up their prayers for the happiness and prosperity of the state. The speaker answered with a smile, that he thought the prayers of the church but a very slender supply. The archbishop, however, prevailed in the dispute; the king discouraged the application of the commons; and the lords rejected the bill which the lower house had framed for despoiling the church of her revenues. The commons were not discouraged by this repulse. In 1410, they returned to the charge with more zeal than before. They made a calculation of all the ecclesiastical revenues, which, by their account, amounted to 485,000 marks a-year, and included 18,400 ploughs of land. They proposed to divide this property among 15 new earls, 1500 knights, 6000 esquires, and 100 hospitals; besides 20,000 pounds a-year, which the king might keep for his own use: and they insisted that the clerical functions would be better performed than at present, by 15,000 parish-priests, at the rate of 7 marks a-piece of yearly stipend. This application was accompanied with an address for mitigating the statutes enacted against the Wickliffites or Lollards, so that the king knew very well from what source it came. He gave the commons, however, a severe reply; and further to satisfy the church that he was in earnest, ordered a Lollard to be burnt before the dissolution of parliament.

The king had been for some time subject to fits, which continued to increase, and gradually brought him to his end. He expired at Westminster in 1413, in the 46th year of his age, and the 13th of his reign. He was succeeded by his son Henry V. whose martial talents and character had at first occasioned unreasonable jealousies in the mind of his father, so that he thought proper to exclude him from all share of public business. The active spirit of Henry being thus restrained from its proper exercise, broke out in every kind of extravagance and dissipation. It is even reported, that, when heated with liquor, he scrupled not to accompany his riotous associates in attacking the passengers on the streets and highways, and robbing them of their goods. No sooner, however, did he ascend the throne, than he called together his former companions, acquainted them with his intended reformation, exhorted them to imitate his example; but strictly prohibited them, till they had given proofs of their sincerity in this particular, to appear any more in his presence: after which, he dismissed them with liberal presents. His father's wife ministers, who had checked his riots, found that they had, unknown to themselves, been paying the highest court to their sovereign; and were received with all the marks of favour and confidence. The chief justice, who had formerly imprisoned the prince himself, and therefore trembled to approach the royal presence, met with

England.

196
Henry V.

England.

praises instead of reproaches for his past conduct, and was exhorted to persevere in the same rigorous and impartial execution of the laws. The king was not only anxious to repair his own misconduct, but also to make amends for those iniquities into which policy or necessity of affairs had betrayed his father. He expressed the deepest sorrow for the fate of the unhappy King Richard, and even performed his funeral obsequies with pomp and solemnity, and heaped favours upon all those who had shown themselves attached to him. He took into favour the young Earl of March, though his competitor for the throne; and gained so far on his gentle and unambitious nature, that he remained ever after sincerely attached to him. The family of Percy was restored to its fortune and honours; and the king seemed desirous to bury all distinctions in oblivion. Men of merit were preferred, whatever party they had been of; all men were unanimous in their attachment to Henry; and the defects of his title were forgot amidst the personal regard which was universally paid him.

197

Enforces
the laws a-
gainst here-
tics.

The only party which Henry was not able to overcome was the new sect of Lollards, or reformers of religion. These were now gaining such ground in England, that the Romish clergy were greatly alarmed, and Henry was determined to execute the laws upon them. The head of that party at present was Sir John Oldcastle, Lord Cobham; a nobleman who had distinguished himself by his valour and military talents on many occasions, and acquired the esteem both of the late and present king. His high character and zeal for the new sect pointed him out to Arundel Archbishop of Canterbury as a proper object of ecclesiastical fury, and therefore he applied to Henry for permission to indict him. The king desired him first to try gentle methods, and undertook to converse with Lord Cobham himself upon religious subjects. He did so, but could not prevail, and therefore abandoned Cobham to his enemies. He was immediately condemned to the flames: but having found means to make his escape, he raised an insurrection; which was soon suppressed, without any other consequence than that of bringing a stain on the sect to which he belonged. Cobham himself made his escape, but four years afterwards was taken and executed as a traitor. Immediately after, the most severe laws were enacted against the Lollards. It was enacted, that whoever was convicted of Lollardy, besides suffering capital punishment according to the laws formerly established, should also forfeit his lands and goods to the king; and that the chancellor, treasurer, justices of the two benches, sheriffs, justices of the peace, and all the chief magistrates in every city and borough, should take an oath to use their utmost endeavours for the extirpation of heresy.

Notwithstanding these terrible laws, the very parliament which enacted them, namely that of 1414, when the king demanded a supply, renewed the offer formerly pressed upon Henry IV. and intreated the king to seize all the ecclesiastical revenues, and convert them to the use of the crown. The clergy were greatly alarmed. They could offer the king nothing of equal value. They agreed, however, to confer on him all the priories alien, which depended on capital abbeys in Normandy, and which had been bequeathed to them

when that province was united to England. The most effectual method, however, of warding off the blow at present was by persuading the King to undertake a war with France, in order to recover the provinces in that kingdom which had formerly belonged to England. This was agreeable to the dying injunction of Henry IV. He advised his son never to let the English remain long in peace, which was apt to breed intestine commotions; but to employ them in foreign expeditions, by which the prince might acquire honour, the nobility in shating his dangers might attach themselves to his person, and all the restless spirits find occupation for their inquietude. The natural disposition of Henry sufficiently inclined him to follow this advice, and the civil disorders of France gave him the fairest prospect of success. Accordingly, in 1415, the king invaded France at the head of 30,000 men. The great progress he made there is related at length under the article FRANCE. He had espoused the king's daughter, and conquered the greatest part of the kingdom. His queen was delivered of a son named Henry, whose birth was celebrated by the greatest rejoicings both at London and Paris; and the infant prince seemed to be universally regarded as heir to both monarchies. But Henry's glory, when it seemed to be approaching the summit, was blasted at once by death, and all his mighty projects vanished. He was seized with a fistula, a distemper which at that time the physicians had not skill enough to cure; and he expired on the 31st of August 1422, in the 34th year of his age, and the 10th of his reign.

England.

198

France in-
vaded.

199

Death of
Henry V.

200

Henry VI.

Henry VI. succeeded to the throne before he was quite a year old, and his reign affords only the most dismal accounts of misfortunes and civil wars. His relations very soon began to dispute about the administration during the minority. The Duke of Bedford, one of the most accomplished princes of the age, was appointed by parliament protector of England, defender of the church, and first counsellor to the king. His brother, the Duke of Gloucester, was fixed upon to govern in his absence, while he conducted the war in France; and in order to limit the power of both brothers, a council was named, without whose advice and approbation no measure could be carried into execution.

The kingdom of France was now in the most desperate situation. The English were masters of almost the whole of it. Henry VI. though but an infant, was solemnly invested with regal power by legates from Paris; so that Charles VII. of France succeeded only to a nominal kingdom. With all these great advantages, however, the English daily lost ground; and in the year 1450 were totally expelled from France. It may easily be imagined, that such a train of bad success would produce discontents among the rulers at home. The Duke of Gloucester was envied by many on account of his high station. Among these was Henry Beaufort, Bishop of Winchester, great uncle to the king, and the legitimate son of John of Gaunt brother to Richard II. The prelate, to whom the care of the king's education had been committed, was a man of great capacity and experience, but of an intriguing and dangerous disposition. He had frequent disputes with the Duke of Gloucester, over whom he gained several advantages on account of his open temper. The Duke of Bed-

+ See
France.

England. ford employed both his own authority and that of parliament to reconcile them, but in vain; their mutual animosities served for several years to embarrass government, and to give its enemies every advantage. The sentiments of the two leaders were particularly divided with regard to France. The bishop laid hold of every prospect of accommodation with that country; and the Duke of Gloucester was for maintaining the honour of the English arms, and regaining whatever had been lost by defeats or delay. Both parties called in all the auxiliaries they could. The bishop resolved to strengthen himself by procuring a proper match for Henry, at that time 23 years old; and then bringing over the queen to his interests. Accordingly, the Earl of Suffolk, a nobleman whom he knew to be steadfast in his attachments, was sent over to France, apparently to settle the terms of a truce which had then been begun, but in reality to procure a suitable match for the king.

201
Married to
Margaret of
Anjou.

The bishop and his friends had cast their eye on Margaret of Anjou, daughter of Regnier, titular king of Sicily, Naples, and Jerusalem; but without either real power or possessions. She was considered as the most accomplished princess of the age, both in mind and person; and it was thought would, by her own abilities, be able to supply the defects of her husband, who appeared weak, timid, and superstitious. The treaty was therefore hastened on by Suffolk, and soon after ratified in England. The queen came immediately into the bishop's measures: Gloucester was deprived of all real power, and every method taken to render him odious to the public. One step taken for this purpose was to accuse his duchess of witchcraft. She was charged with conversing with one Roger Bolingbroke, a priest and reputed necromancer; and also with one Mary Gourdmain, who was said to be a witch. It was asserted that these three in conjunction had made an image of the king in wax, which was placed before a gentle fire; and as the wax dissolved, the King's strength was expected to waste; and upon its total dissolution, his life was to be at an end. This accusation was readily believed in that superstitious age. The prisoners were pronounced guilty; the duchess was condemned to do penance and suffer perpetual imprisonment; Bolingbroke the priest was hanged, and the woman burnt in Smithfield.

The bishop, called also the *Cardinal*, of Winchester, was resolved to carry his resentment against Gloucester to the utmost. He procured a parliament to be summoned, not at London, which was too well affected to the duke, but at St Edmundsbury, where his adherents were sufficiently numerous to overawe every opponent. As soon as Gloucester appeared, he was accused of treason and thrown into prison; and on the day on which he was to make his defence, he was found dead in his bed, though without any signs of violence upon his body.

202
Duke of
Gloucester
murdered.

The death of the Duke of Gloucester was universally ascribed to the Cardinal of Winchester, who himself died six weeks after, testifying the utmost remorse for the bloody scene he had acted. What share the queen had in this transaction, is uncertain; but most people believed that without her knowledge the duke's enemies durst not have ventured to take away his life. The king himself shared in the general ill-will, and he

never had the art to remove the suspicion. His incapacity also began every day to appear more clearly, and a pretender to the throne soon made his appearance.

England.

In the year 1450, Richard Duke of York began to think of preferring his claims to the crown. All the males of the house of Mortimer were extinct; but Anne, the sister of the last Earl of March, having espoused the Earl of Cambridge, who had been beheaded for treason in the reign of Henry V. had transmitted her latent, but not yet forgotten claim, to her son Richard. This prince, defended by his mother from Philippa only daughter of the Duke of Clarence, second son of Edward III. stood plainly in order of succession before the King; who derived his descent from the duke of Lancaster, third son of that monarch. The duke was a man of valour and abilities, as well as of some ambition; and he thought the weakness and unpopularity of the present reign afforded a favourable opportunity to assert his title. The ensign of Richard was a white rose, that of Henry a red one; and this gave names to the two factions, who were now about to drench the kingdom in blood.

203
Duke of
York's title
to the
crown.

After the Cardinal of Winchester's death, the Duke of Suffolk, who also had been concerned in the assassination of Gloucester, governed every thing with uncontrollable sway. His conduct soon excited the jealousy of the other nobility, and every odious or unsuccessful measure was attributed to him. The duke, however, imagining that his crimes were of such a nature as could not be proved, boldly called upon his enemies to show an instance of his guilt. The house of commons immediately opened against him a charge of corruption, tyranny, and treason. He was accused of being the cause of the loss of France; of persuading the French king, with an armed force, to invade England; and of betraying the secrets of state. The popular resentment against him was so strong, that Henry, in order to secure him as much as possible, sentenced him to five years banishment. This was considered by his enemies as an escape from justice. The captain of a ship was therefore employed to intercept him in his passage to France. He was seized near Dover, his head struck off on the side of a long boat, and his body thrown into the sea.

204
Duke of
Suffolk be-
nished.

205
And there-
dred.

The complaints against Henry's government were heightened by an insurrection headed by one John de Cade, a native of Ireland. He had been obliged to fly over into France for his crimes; but, on his return, seeing the people prepared for violent measures, he assumed the name of *Mortimer*; and, at the head of 20,000 Kentish men, advanced towards Blackheath. The king sent a message to demand the cause of their rising in arms. Cade in the name of the community answered, That their only aim was to punish evil ministers, and procure a redress of grievances for the people. On this a body of 15,000 troops were levied, and Henry marched with them in person against Cade, who retired on his approach, as if he had been afraid of coming to an engagement. He lay in ambush, however, in a wood; not doubting but he should be pursued by the king's whole army; but Henry was content with sending a detachment after the fugitives, and returning to London himself; upon which Cade issued from his ambuscade, and cut the detachment in pieces.

206
Insurrec-
tion of John
Cade.

Soon.

England.

England.

Soon after, the citizens of London opened their gates to the victor; and Cade, for some time, maintained great order and regularity among his followers. He always led them out into the fields in the night-time, and published several edicts against plunder and violence of any kind. He was not, however, long able to keep his people in subjection. He beheaded the treasurer Lord Say, without any trial; and soon after, his troops committing some irregularities, the citizens resolved to shut their gates against him. Cade endeavouring to force his way, a battle ensued, which lasted all day, and was ended only by the approach of night. The Archbishop of Canterbury, and the chancellor, who had taken refuge in the Tower, being informed of the situation of affairs, drew up, during the night, an act of amnesty, which was privately dispersed among the rebels. This had such an effect, that in the morning Cade found himself abandoned by his followers; and retreating to Rochester, was obliged to fly alone into the woods. A price being set on his head by proclamation, he was discovered and slain by one Alexander Eden; who, in recompence for this service, was made governor of Dover castle.

207
Duke of
York sus-
pected by
the court.

The court now began to entertain suspicions that the insurrection of John Cade had not happened merely in consequence of his own machinations and ambition, but that he had been instigated thereto by the Duke of York, who, as we have already seen, pretended a right to the crown. As he was about this time expected to return from Ireland, and a report took place that he was now to assert his supposed right by force of arms, orders were issued in the king's name to deny him entrance into England. This was prevented by his appearing with no more than his ordinary attendants; but though he thus escaped the danger for the present, he instantly saw the necessity of proceeding in support of his claim. His partizans were instructed to distinguish between his right by succession and by the laws of the kingdom. The adherents of Lancaster maintained, that though the advancement of Henry IV. might be looked upon as irregular, yet it was founded upon general consent; or even allowing it to have been at first invalid, it had now been for a long time established, and acquired solidity of consequence; nor could the right of succession at any rate be pleaded for the purpose of overthrowing the general peace and tranquillity of the kingdom. The principles of liberty as well as the maxims of true policy had been injured by the house of York; while the public were bound to those of Lancaster, no less by political than moral duty, in consequence of the oaths of fealty that had been so often sworn to them; the Duke of York himself having repeatedly sworn allegiance to them, and thus indirectly renounced those claims which he now brought forward to disturb the public tranquillity. On the part of the Duke of York, it was replied, that the good of the people required the maintenance of order in the succession of princes; that, by adhering constantly to this rule, a number of inconveniences would be prevented which must otherwise ensue; and though that order had been broken through in the case of Henry IV. it was never too late to remedy any pernicious precedent. It would indeed be a great encourage-

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Argument
for and a-
gainst the
houses of
York and
Lancaster.

ment to usurpers, if the immediate possession of power, or their continuance in it for a few years, could convert them into legal princes; and the people must be in a very miserable situation, if all restraints on violence and ambition were taken off, and full liberty given to every innovator to make what attempts he pleased. They did not indeed deny that time might confer solidity on a government originally founded in usurpation; but a very long course of years was not only required for this purpose, but a total extinction of those who had any just title. The deposition of Richard II. and advancement of Henry IV. were not legal acts, but the effects of mere levity in the people; in which the house of York had acquiesced from necessity, and not from any belief of the justice of their cause; nor could this be ever interpreted into any renunciation of their pretensions; neither could the restoration of the true order of succession be considered as an encouragement to rebellion and turbulence, but the correction of a former abuse by which rebellion had been encouraged. Besides, the original title of Henry IV. was founded entirely on present convenience; and even this was now entirely shifted to the house of York. The present prince was evidently incapable of governing the kingdom by reason of his imbecility; so that every thing was governed either by corrupt ministers or an imperious queen, who engaged the nation in foreign connections entirely contrary to its interests; while on the other hand, the true heir of the crown was a prince of approved judgment and experience, and a native of England, who, by his restoration, would undoubtedly correct all those abuses of which there was now such just reason to complain.

In this dispute it was evident that the house of York had the better in point of argument; nevertheless, as a prince of the house of Lancaster was in immediate possession of the throne, and could by no means be charged with any crime, the cause of the former was less generally interesting; especially as it must always have been uncertain, *a priori*, whether the Duke of York would have governed any better than King Henry. After his return from Ireland, however, the former Duke used all his power and influence to foment the dissensions which had for some time prevailed in the kingdom; and the conduct of the next parliament manifested the success of his intrigues. A violent attack was made upon such noblemen as were known to be most in favour with the king. The house of commons presented a petition against the Duke of Somerset, the Dukes of Suffolk, the Bishop of Chichester, Lord Dudley, and several others of inferior rank; praying not only that the king would remove them from his council, but that he would prohibit them from coming within twelve miles of the court. Henry not daring to refuse this petition altogether, consented to banish all those of inferior rank, whom the commons had specified, but only for a year; and this too on condition that he had no use for their assistance in quelling any rebellion. But he rejected a bill for attainting the late Duke of Suffolk, and proposed some other measures which seemed to militate against the court, though it had passed both the house of lords and the house of commons.

Encouraged by this disagreement between Henry and

209
The Duke
of York
fomented
dissensions
between
the king
and parlia-
ment.

England.

210
Richard
raises an
army;

211
Bar is obli-
gated to re-
tire.

212
He is ap-
pointed
protector
in conse-
quence of
the king's
illness.

213
Is deposed
and levies
an army.

214
History of
the civil
war be-
tween Hen-
ry and the
Duke of
York.

and his parliament, the Duke of York raised an army of 10,000 men, with whom he marched towards London, demanding a reformation in matters of government, and the removal of the Duke of Somerset. This first enterprise, however, proved unsuccessful; the gates of the city were shut against him, and he was pursued by the king at the head of a superior army. On this he retired into Kent; and as there was a number of his own friends in the army of the king, a conference took place, in which Richard still insisted upon the removal of the Duke of Somerset, and his submitting to be tried in parliament. This request was in appearance complied with, and Somerset arrested: the Duke of York was then persuaded to wait upon the king in his royal pavilion; but, on repeating his charge against the duke, he was surprised to see the latter come out from behind the curtain, and offer to maintain his innocence. Richard perceiving that he had not sufficient interest to ruin his adversary, pretended to be satisfied, and retired to his seat at Wigmore in Wales; and during the time he resided there, a better opportunity was given him of accomplishing his designs than he could have hoped for. The king fell into a kind of lethargic disorder, which increased his natural imbecility to such a degree, that he could no longer retain a shadow of royalty. Richard now had interest enough to get himself appointed protector, with power to hold parliaments at pleasure; with which high office he was no sooner invested, than he turned out all the Lancastrian party from their offices, and sent the Duke of Somerset to the Tower; but on the recovery of the king, which happened in no long time after, he himself was dismissed from his employment, the Duke of Somerset released, and the administration once more put into his hands. On this the duke of York levied an army, merely, as he pretended, to enforce the reformation of government and the removal of the Duke of Somerset. Thus Henry, though fore against his will, was obliged to face him in the field. A battle ensued at St Alban's; in which the royalists were defeated, and the Duke of Somerset, the chief partisan of their cause, killed in the action. The king himself was wounded, and took shelter in a cottage near the field of battle; where he was taken prisoner, but was afterwards treated with great respect and kindness by the Duke of York.

Henry, though he was now only a prisoner treated with the forms of royalty, was nevertheless pleased with his situation; but his queen, a woman of a bold and masculine spirit, could not bear to have only the appearance of authority, while others enjoyed all the real power. She therefore excited the king once more to assert his right by force of arms; and after several manoeuvres, the Duke of York was obliged to retire from court. A negotiation for peace was at first set on foot, but the mutual distrusts of both parties soon broke it off. The armies met at Bloreheath on the borders of Staffordshire, on the 23d of September 1459; and the Yorkists at first gained some advantages. But when a more general engagement was about to ensue, a body of veterans who served under the Duke of York deserted to the king; and this so intimidated the duke's party, that they separated the next day without striking a blow. The

Duke of York fled to Ireland; and the Earl of Warwick, one of his ablest and best supporters, escaped to Calais, with the government of which he had been entrusted during the late protectorship.

The York party, though thus in appearance suppressed, only waited a favourable opportunity of retrieving their affairs. Nor was this opportunity long wanting. Warwick having met with some successes at sea, landed in Kent; and being there joined by other barons, marched up to London amidst the acclamations of the people. The city immediately opened its gates to him, and he soon found himself in a condition to face the royal army. An engagement ensued at Northampton on the 10th of July 1460; in which the royalists were entirely defeated, and the king again taken prisoner. The Duke of York then openly laid claim to the crown; and on this occasion the first instance of a spirit of national liberty is said to have appeared in the House of Lords. The cause of Henry and the Duke of York was solemnly debated; and the latter, though a conqueror, did not absolutely gain his cause. It was determined that Henry should possess the throne during his life; and that the Duke of York should be appointed his successor, to the utter exclusion of the Prince of Wales, who was then a child.

Though the royal party now seemed destitute of every resource, the queen still retained her intrepidity. She fled into Wales, where she endeavoured to raise another army. The northern barons, provoked at the southern ones for settling the government and succession to the crown without their consent, soon furnished her with an army of 20,000 men. Another battle was fought near Wakefield Green, on the 24th of December 1460. The Yorkists were defeated, and the duke himself was killed in the action. His head was afterwards cut off by the queen's orders, and fixed on one of the gates of York, with a paper-crown, in derision of his pretended title. His son the Earl of Rutland, a youth of 17, was taken prisoner, and killed in cold blood by Lord Clifford, in revenge for his father's death, who had fallen in the battle of St Alban's.

After this victory, Margaret marched towards London, in order to get the king at liberty; but the Earl of Warwick, who now put himself at the head of the Yorkists, led about the captive king, in order to give a sanction to his proceedings. He engaged the queen's forces at St Albans; but through the treachery of Lord Lovelace, who deserted during the heat of the engagement with a considerable body of forces, Warwick was defeated, and the king fell once more into the hands of his own party.

The submission of the city of London seemed now to be the only thing wanting to complete the queen's success; but Warwick had seened it in his interests, and the citizens refused to open their gates to the queen. In the mean time, young Edward, eldest son of the late Duke of York, put himself at the head of his father's party. He was now in the bloom of youth, remarkable for the beauty of his person and his bravery, and was a great favourite of the people. He defeated Jasper Tudor Earl of Pembroke, at Mortimer's cross in Herefordshire. The earl himself was taken prisoner, and immediately beheaded by Edward's orders.

England.

215
Duke of
York killed.

England. ders. After this, he advanced to London; and being joined by the remainder of Warwick's army, he soon obliged Margaret to retire, entered the city amidst the acclamations of the people, and was crowned king on the 5th of March 1461.

Notwithstanding all her misfortunes, however, Margaret still continued undaunted. She retired to the north, where she was soon joined by such numbers, that her army amounted to 60,000 men. She was opposed by young Edward and Warwick at the head of 40,000; and both armies met near Tooton in the county of York, on the 29th of March 1461. A bloody battle ensued, in which the queen's army was totally defeated; and as Edward, prompted by his natural cruelty, had ordered no quarter to be given, 40,000 of the Lancastrians were slain in the field or in the pursuit. Edward is said to have gained this victory by means of a violent storm of snow, which blew fell in the face of the queen's army, and so blinded them that they could scarce make any use of their arms. After this disaster the queen fled to Scotland with her husband and son; and notwithstanding all the misfortunes she had already met with, resolved once more to enter England at the head of 5000 men granted her by the king of France. But even here she was attended by her usual bad fortune. Her little fleet was dispersed by a tempest, and she herself escaped with the utmost difficulty by entering the mouth of the Tweed. Soon after, a defeat, which her few forces sustained at Hexham, seemed to render her cause entirely desperate; and the cruelties practised upon all her adherents rendered it very dangerous to befriend her.

218 By these repeated misfortunes the house of Lancaster was so effectually ruined, that Margaret was obliged to separate from her husband, and both of them to shift for themselves the best way they could. The king was still protected by some of his friends, who conveyed him to Lancashire, where he remained in safety for a twelvemonth; but being at last discovered, he was thrown into the Tower and kept close prisoner. The queen fled with her son to a forest, where she was set upon by robbers, who stripped her of her rings and jewels, treating her otherwise with the utmost indignity. A quarrel which happened among them about the division of the spoil afforded her an opportunity of escaping from their hands into another part of the forest, where she wandered for some time without knowing what to do. At last, when quite spent with hunger and fatigue, she saw a robber coming up to her with a drawn sword in his hand. Finding it altogether impossible to escape, she suddenly took the resolution of putting herself under his protection. Advancing towards him, therefore, and presenting the young prince, "Here (says she), my friend, I commit to your care the safety of your king's son." This address so much surprised the robber, that, instead of offering her any injury, he professed himself entirely devoted to her service. After living for some time concealed in the forest, she was at last conducted to the sea-side, where she found a ship which conveyed her to Flanders. On her arrival there, she went to her father's house, who, though very poor, gave her such entertainment as he could afford; and in this retreat she staid some years in expectation of finding an opportunity of retrieving her affairs.

Edward, in the mean time, thinking himself securely fixed on the throne, gave a loose to his favourite passions; one of which was an immoderate love of women. To divert him from this, the Earl of Warwick, to whom he was indebted for his crown, advised him to marry. Edward consented, and sent him over to the continent to negotiate a match with the princess of Savoy. The negotiation proved successful; but, in the mean time, the king had privately espoused Elizabeth Woodville, daughter of Sir Philip Woodville, who had married the Duchess of Bedford after the death of her first husband. Edward had employed his arts of seduction against this lady in vain before he married her; but unfortunately the match was concluded just at the time that the Earl of Warwick had proved successful in his negotiation with the princess of Savoy. The minister therefore returned full of indignation against his sovereign; and Edward, forgetting how great cause he had to be offended, determined to remove him entirely from his councils. Warwick was likewise disgusted by the favour shown to the queen's party; which, though certainly a piece of very commendable policy in Edward, was entirely disagreeable to the ambitious disposition of that nobleman. A plan of revenge was therefore thought of; and a most powerful combination was formed against Edward: to accomplish which, Warwick not only employed his own influence, which was very extensive, but likewise that of the Duke of Clarence, Edward's brother, to whom the earl had allied himself by giving him his daughter in marriage; after which he persuaded him to embrace his cause. Some circumstances which took place about this time also favoured the scheme. The inhabitants about St Leonard's in Yorkshire complained, that the duties levied for that institution, and which had been originally appointed for pious purposes, were secreted by the managers, who refused to contribute their part. As the clergy were concerned in this affair, they attempted to silence their antagonists by ecclesiastical fulminations against them; upon which the latter took up arms, fell upon the officers of the hospital, and having massacred them, proceeded towards York, to the number of 15,000. In the first skirmish, they had the misfortune to lose their leader, who was instantly executed. The rebels, however, still continued in arms, and in a short time appeared in such numbers as to become formidable to government. Henry Earl of Pembroke was sent against them with a body of 5000 men; and having taken Sir Henry Nevil, one of the leaders of the insurgents, prisoner, instantly put him to death; but this was soon revenged by a similar execution on himself, who happened to be defeated and taken prisoner a short time after. This defeat had been occasioned by a disagreement betwixt the Earls of Pembroke and Devonshire; in consequence of which the latter had gone off with his troops, leaving Pembroke to shift for himself the best way he could. The king, enraged at this, caused Devonshire to be executed in a like summary manner: but this was of no service to his cause; a new body of insurgents appeared under Sir Robert Welles, son to a nobleman of that name. The latter, in order to secure himself from all suspicions of disloyalty, fled to a monastery; but he was soon enticed from thence and put to death by the insidious promises of king Edward, whose treachery was equal to his cruelty. His

England.
220 Warwick disaffected by Edward.

227 The king's brother joins in the conspiracy against him.

232 An insurrection in Yorkshire.

219 The queen retires to Flanders.

England.

son soon after shared the same fate, being defeated and taken prisoner by Edward, who instantly ordered him to be beheaded, along with Sir Thomas Launde and other persons of distinction.

223
Warwick
and Claren-
ce join the in-
furgents.

Notwithstanding such an appearance of a general insurrection, the king had so little suspicion of the loyalty of Warwick and Clarence, that he employed them in raising troops to quell the insurgents. Instead of executing their commission with fidelity, however, they joined the malecontents with all the forces they could raise; but being quite disconcerted by the defeat and death of Sir Robert Welles, they retired to Lancashire, in hopes of being joined by Lord Stanley, who had married the Earl of Warwick's sister. Being disappointed in this, they were obliged to disband their army, and fly into Devonshire, whence they set sail for Calais. Upon their arrival on the continent, matters seemed not to be much mended: the deputy-governor, whom Warwick had left, refused him admittance; nor would he even allow the Dukes of Clarence to land, though she had been delivered of a son on board only a very few days before, and was at that time extremely ill. Being well acquainted, however, with the uncertainty of the affairs of England at that time, he afterwards made an apology to Warwick for this behaviour. The latter pretended to be easily reconciled; but immediately left the place, having seized some Flemish vessels which he found lying in the neighbourhood.

224
Reconciliation
between War-
wick and
the queen

As a very close alliance subsisted between Warwick and the Duke of Burgundy, the king of France became uneasy; and therefore, as soon as the earl landed on his dominions, received him with the greatest marks of esteem. The reconciliation betwixt him and the unfortunate Queen Margaret now seemed to be natural, though, considering all circumstances, this must have formerly appeared in a manner impossible. The earl's father had been put to death by the orders of Margaret; and Warwick, in return, had twice taken prisoner King Henry, banished the queen, and put to death almost all their faithful adherents. By the mediation of the French monarch, however, all differences were accommodated. A fleet was prepared to reconduct them to England; and seizing a proper opportunity, they landed at Dartmouth with a small body of troops, while Edward was in the north suppressing an insurrection which had lately appeared there. Warwick was attended with astonishing success on his arrival in England, and in less than six days saw himself at the head of 60,000 men. Edward was now obliged in his turn to fly the kingdom. Having narrowly escaped an attempt made upon his person by the Marquis of Montague, he embarked on board a small fleet which lay off Lynn in Norfolk. While at sea, he was chased by some ships belonging to the Hans Towns that were then at war both with France and England; but at length, having escaped all dangers, Edward landed safely in Holland, where he met with but an indifferent reception from the Duke of Burgundy, with whom he had lately entered into an alliance.

225
He lands
in Eng-
land.

Warwick in the mean time advanced to London, and once more re-leased and placed on the throne the miserable king Henry VI. A parliament was called, which very solemnly confirmed Henry's title to the throne, and Warwick himself was dignified by the people with the title of the *king-maker*. All the at-

No 116.

tainers of the Lancastrians were revered; and every one was restored who had lost either honours or fortune by his former adherence to Henry's cause. All the adherents of Edward fled to the continent, or took shelter in monasteries, where they were protected by the ecclesiastical privileges. But Edward's party was not yet destroyed. After an absence of nine months, being seconded by a small body of troops granted him by the Duke of Burgundy, he made a descent at Ravenspur in Yorkshire. At first he met with little success; but his army increasing on his march, he was soon in a condition to appear before the capital, which immediately opened its gates.

The unfortunate Henry was thus again plucked from the throne; and the hopes of Warwick were almost totally blasted by the defection of Clarence. Edward's brother. Nothing now remained but to come to an engagement as soon as possible. Warwick knew his forces to be inferior to those of Edward, but placed great dependence on his own generalship. He therefore advanced to Barnet, within ten miles of London, where he resolved to wait the coming of Edward. The latter soon came up with him, and on the 14th of April 1471, a most obstinate and bloody battle was fought. Edward, according to custom, had ordered no quarter to be given; and obtained the victory through a mistake of a body of Warwick's forces, who fell with fury on their own party instead of the enemy. The earl himself was slain, together with his brother, and 10,000 of his bravest followers.

The queen was just then returned with her son from France, where she had been soliciting supplies. She had scarce time to refresh herself from the fatigues of the voyage, when she received the fatal news of the death of Warwick, and the total destruction of her party. All her resolution was not able to support her under such a terrible disaster. Her grief now for the first time, it is said, manifested itself by her tears; and she immediately took sanctuary in the abbey of Beaulieu in Hampshire. Here she still found some friends willing to assist her. Tudor Earl of Pembroke, Courtney Earl of Devonshire, the Lords Wenlock and St John, with some other men of rank, encouraged her yet to hope for success, and promised to stand by her to the last. On this assurance, she resumed her courage; and advancing through the counties of Devon, Somerset, and Gloucester, increased her army every day. At last, however, she was overtaken by Edward with his victorious army at Tewkesbury, on the banks of the Severne. The Queen's army was totally defeated; the Earl of Devonshire and Lord Wenlock were killed in the field; the Duke of Somerset, and about 20 other persons of distinction, who had taken shelter in a church, were surrounded, dragged out, and immediately beheaded; about 3000 of their party fell in battle, and the army was entirely dispersed. Queen Margaret and her son were taken prisoners, and brought to the king, who asked the prince in an insulting manner, how he dared to invade his dominions? The young prince replied, that he came thither to claim his just inheritance; upon which Edward struck him on the face with his gauntlet. The Dukes of Clarence and Gloucester, Lord Hastings, and Sir Thomas Gray, taking this blow as a signal for farther violence, hurried the prince into the next apartment, and there dispatched him with their

England.

226
Total de-
struction of
the queen's
party.

England.

England.

their daggers. Margaret was thrown into the Tower along with her husband Henry, who expired in that confinement a few days after. It was universally believed that he was murdered by the duke of Gloucester, though of this there was no direct evidence. Margaret was ransomed by the king of France for 50,000 crowns, and died a few years after in a most miserable situation.

Edward being now freed from all his enemies, began to inflict punishment on those who had formerly appeared against him. Among the cruelties he committed, that on his brother the duke of Clarence was the most remarkable. The king happening to be one day hunting in the park of Thomas Burdet, a servant of the duke killed a white buck which was a great favourite of the owner. Burdet, vexed at the loss, broke out into a passion, and wished the horns of the deer in the belly of the person who advised the king to that insult. For this exclamation Burdet was tried for his life, and executed at Tyburn. The duke of Clarence exclaimed against the iniquity of this sentence; upon which he was arraigned before the house of peers, found guilty, and condemned to death. The only favour granted him was to have the choice of his death; and his choice was a very singular one, namely, to be drowned in a butt of Malmsey wine; which was accordingly done.—The rest of this reign affords little else than an history of the king's amours. Among his many mistresses, Jane Shore was the most remarkable; (see SHORE.) The king died on the 9th of April 1482, in the 42d year of his age, and 21st of his reign, counting from his first assuming the crown. Besides five daughters, he left two sons; Edward prince of Wales, his successor, then in his 13th year; and Richard duke of York in his 9th.

228
Edward V.

On the death of Edward IV. the kingdom was divided into two new factions. The queen's family, which during the last reign had come into power, was become obnoxious to the old nobility, who considered them as their inferiors. The king had endeavoured to prevent these animosities from coming to a height, by desiring on his death-bed that his brother Richard duke of Gloucester should be entrusted with the regency; and recommended peace and unanimity during the minority of his son. But the king was no sooner dead than the former resentment between these parties broke out with violence; and the duke of Gloucester, who was endued with almost every bad quality, resolved to profit by their contentions. His first step was to get himself declared protector of the realm; and having arrested the earl of Rivers, the king's uncle and guardian, he met young Edward in his way from Ludlow castle, where the late king had resided during the latter part of his reign, and respectfully offered to conduct him to London. Having thus secured the person of the king, he next got possession of his brother's person also. The queen had retired with this child into Westminster abbey; and it was not without extreme regret that she delivered him up at the intercession of the primate and archbishop of York.

In a few days after Gloucester had made himself master of the persons of the two princes, he had them confined in the Tower, under pretence of guarding them from danger; and soon after spread reports of their illegitimacy, and by pretended obstacles put off the

young king's coronation. Lord Stanley first began to suspect his designs; and communicated his suspicions to lord Hastings, who had long been firmly attached to the king's family. Lord Hastings would not at first give credit to this surmise; but he very soon had a fatal proof of the truth of what had been communicated to him. On the 13th of June 1483, he was hurried out of the council-room in the Tower by Gloucester's order, and beheaded on a log of timber. The soldiers who carried him off made a bustle as though an attempt had been made to rescue him, and one of them discharged a blow at Lord Stanley's head with a pole-ax; but he happily escaped by shrinking under the table. The same day were executed the Earl Rivers, and some others, who had committed no other crime than being faithful to the young king.

The protector now thought he might with safety lay claim to the throne. He had previously gained over the duke of Buckingham, a nobleman of great influence among the people. He used his utmost endeavours to inspire the people with a notion of the illegitimate birth of the late king, and consequently of his children. Dr Shaw, a popular preacher, was also hired to harangue the people to the same purpose from St Paul's cross. Having expatiated on the incontinence of the queen, and the illegality of the young king's title, he then made a panegyric on the virtues of the protector. "It is the protector (continued he) who carries in his face the image of virtue, and the marks of a true descent. He alone can restore the lost glory and honour of the nation." It was hoped that upon this occasion some of the populace would have cried out, "Long live King Richard!" but the audience remaining silent, the duke of Buckingham undertook in his turn to persuade them. Having expatiated on the calamities of the last reign and the illegitimacy of the present race, he told the people, that he saw only one method of warding off the miseries which threatened the state, which was by electing the protector; but he seemed apprehensive that he would never be prevailed upon to accept a crown accompanied with such difficulty and danger. He next asked his auditors, whether they would have the protector for their king? but was mortified to find that a total silence ensued. The mayor, who was in the secret, willing to relieve him in this embarrassed situation, observed, that the citizens were not accustomed to be harangued by a man of his quality, and would only give an answer to their recorder. This officer, therefore, repeated the duke's speech; but the people continuing still silent, "This is strange obduracy (cried the duke): we only require of you, in plain terms, to declare, whether or not you will have the duke of Gloucester for your king; as the lords and commons have sufficient power without your concurrence?" At this, some of the meanest apprentices, incited by the servants of the protector and Buckingham, raised a feeble cry of "God save King Richard!" The mob at the door repeated the cry; and throwing up their caps into the air, cried out, "A Richard! A Richard!" After this farce was acted, Buckingham, on the 24th of June 1483, waited on Richard with offers of the crown; but the protector, with hypocritical modesty, at first declined the offer; till being told, that the people, in case of his refusal, must look out for one that would be more compliant,

229
Duke of Gloucester declared protector.

England. he accepted the government of England and France, with a resoluton, as he said, to defend the one and subdue the other.

230
Richard III.

The first step taken by the new king was to fend orders to Sir Robert Brackenbury governor of the Tower, to put the young princes to death. But this he refused; and submissively answered, that he knew not how to embroe his hands in innocent blood. A fit instrument for this purpose, however, was not long wanting. Sir James Tyrrel readily undertook the office; and Brackenbury was ordered to resign the keys to him for one night. Tyrrel choosing three associates, Slater, Deighton, and Forest, came in the night-time to the door of the chamber where the princes were lodged; and sending in the assassins, bid them execute their commission, while he himself staid without. They found the young princes in bed, and fallen into a sound sleep. The assassins smothered them with the bolster and pillows; after which they showed their naked bodies to Tyrrel, who ordered them to be buried at the stair-foot under an heap of stones (c.)

231
Edward V.
and his
brother
murdered.

Richard having thus secured himself on the throne by the most iniquitous methods, attempted to strengthen his interest by foreign alliances, and procuring the favour of the clergy at home by great indulgences; but he found his power threatened from a quarter where he least expected an attack. The duke of Buckingham, who had been so instrumental in raising him to the throne, did not think himself properly rewarded. He made a demand of some confiscated lands in Hereford, to which his family had an ancient claim. Richard either reluctantly complied with his request, or only granted it in part; so that a coolness soon ensued between them, and in a little time Buckingham came to a resolution of dethroning the monarch whom he had just raised. For some time he remained in doubt, whether he should assume the crown himself or set up another. At length he determined on the latter; and resolved to declare for Henry earl of Richmond, who was at that time an exile in Brittany, and was considered as the only surviving branch of the house of Lancaster. He was one of those who had the good fortune to escape the numerous massacres of the former reigns; but as he was a descendant of John of Gaunt by the female line, he was for that reason obnoxious to those in power. He had long lived in exile, and was once delivered over to the ambassadors of Edward IV. who were preparing to carry him to England; when the duke of Brittany, who delivered him, repented of what he had done, and took him from the ambassadors just as they were carrying him on ship-board. His right to the crown by succession was very doubtful: but the cruel behaviour of Richard inclined the people in general greatly to favour him; and, to give an additional strength to his title, a match was projected betwixt him and the princess Elizabeth, the eldest daughter of Edward IV. which, by uniting the two rival families, would put an end to those dissen-

232
Buckingham determines to support the claim of the Earl of Richmond to the throne.

sions which had so long filled the kingdom with bloodshed and confusion. Richard, in the mean time, from some reasons which have not been particularized by historians, began to entertain doubts of the fidelity of Buckingham, and determined to cut him off. For this purpose he sent for him to court: but Buckingham, instead of obeying the summons, fled into Wales, where he raised a considerable army, and forthwith set out to the eastward with a design to invade England. Richard hastened to meet him with what forces he could raise; but the march of Buckingham being retarded by a most uncommon inundation of the Severn which lasted 10 days, his troops were so disheartened at this event, that they almost all deserted him. The duke was therefore obliged to fly in distress, and Richard instantly set a price upon his head. Buckingham was now obliged to trust his life in the hands of an old servant of his own, named *Banister*; but this man, tempted by the greatness of the reward, betrayed him to the sheriff of Shropshire, by whom he was seized and conducted to Richard at Salisbury, who caused him to be executed without delay. The earl of Richmond, in the mean time, had set sail from St Maloes with a body of 5000 men: but after his arrival in England, receiving the disagreeable news of Buckingham's misfortune, he deserted again for Bretagne; while Richard, emboldened by the bad success of his enemies, determined to confirm his title to the throne by calling a parliament, which till this time he had not ventured to do. At present, matters were so circumstanced, that the parliament had no other resource than to comply with his desires, and acknowledge his right to the crown. An act was passed confirming the illegitimacy of Edward's children; and an attainder was also confirmed against the earl of Richmond; the duties of tonnage and poundage were granted to the king for life; and his only son Edward, then about 12 years of age, was created Prince of Wales. In return for these concessions, Richard passed several popular laws, particularly against the extorting of money by benevolences, and some others calculated to gain the good will of the opposite party. He paid his court also to the queen-dowager with such assiduity and success, that he left her sanctuary, and put herself and her daughters into his hands. The ambition and cruelty of this man indeed are said to have extinguished every sentiment of natural affection as well as humanity. He had married Anne, the second daughter of the earl of Warwick, and widow of Edward prince of Wales, whom he himself had murdered; but having born him but one son who died about this time, he considered her as an invincible obstacle to the accomplishment of his desires; for which reason it was thought he put an end to her life by poison: and as he knew that the projected match between the earl of Richmond and the Princess Elizabeth could only make the rivalship of the former any way formidable, he resolved to obtain a dispensa-

England.

233
He takes up arms, but is abandoned by his army and put to death.

234
Richmond lands in England, but is obliged to return.

235
Richard's title confirmed by parliament.

(c) These circumstances are said to have been confessed in the succeeding reign, though the perpetrators escaped punishment. The bodies of the two princes were fought for without any success under the reign of Henry VII. but in the time of Charles V. the bones of two persons answering to their age were found in the spot where they were said to have been buried; which, being supposed to be the remains of these two unfortunate youths, they were buried under a marble monument in Westminster abbey.

England.

tion from the pope for marrying her himself. The queen-dowager is even said to have come into this scheme with a view to recover her power; but the prince herself always rejected his addresses with abhorrence. The refusal of the prince occasioned no small perplexity in Richard; and before he could determine on any proper method of accomplishing his purpose, he received news of Richmond's preparations for landing in England. These being soon accomplished, Henry set sail from Harfleur in Normandy, and landed without opposition, on the 17th of August 1485, at Milford haven in Wales. Richard in the mean time, not knowing where the invasion was to take place, had posted himself at Nottingham; which being almost in the centre of the kingdom, was therefore proper for resisting any invader. Sir Rice ap Thomas and Sir Walter Herbert were commissioned by Richard to oppose his rival in Wales; but the former immediately deserted to him, and the latter made but a very feeble resistance. Richard instantly resolved to meet his antagonist, and to risk every thing on the event of a battle. Richmond, though he had not above 6000 men, and the king near double that number, did not decline the combat; being chiefly encouraged by the promises of Lord Stanley to join him with a body of 7000 men, and with whom he hovered at a little distance from the intended field of battle, seemingly indetermined to join either side.

²³⁷
Richard de-
feated and
killed.

The king having commanded his army to form themselves in order of battle, intrusted the van to the duke of Norfolk, while he himself, with the crown on his head, took the command of the main body. Lord Stanley in the mean time posted himself on one flank between the two armies, while his brother Sir William took his station directly opposite. As his intention of either joining the enemy or keeping neutral during the time of the engagement was now far from being doubtful, Richard sent him orders to join the main body; which not being complied with, the tyrant determined to put to death Stanley's son, who had been left with him as a pledge of his father's fidelity. He was persuaded, however, to defer the execution till after the engagement, that Stanley might thereby be induced to delay his purpose in joining the enemy. This, however, did not answer the expectation. Soon after the engagement was begun, Stanley deserted Richard's party, and joining Richmond entirely decided the fortune of the day. The tyrant perceiving his situation to be quite desperate, and seeing his rival at no great distance from him, drove up against him with fury, in hopes that either Henry's death or his own would decide the victory between them. He killed Sir William Brandon the earl's standard-bearer; he dismounted Sir John Cheyne; and was within reach of Richmond, when Sir William Stanley breaking in with his troops, Richard was surrounded and overwhelmed by numbers. His body was found in the field, covered with dead enemies, and besmeared with blood. It was thrown carelessly across a horse, carried to Leicester amidst the shouts of insulting executors, and interred in the Gray-Friar's church of that place.

The usurper's crown being found on the field of battle, was placed on the head of the conqueror, while the whole army cried out, "Long live king Henry!" Two days after the battle, Henry gave orders to con-

sine Edward Plantagenet earl of Warwick, and son of the unfortunate duke of Clarence; and to release the Princess Elizabeth, who had been confined in the Tower. He then advanced by slow and gradual marches to the city of London, where he was received with the greatest demonstrations of joy. He was crowned King of ²³⁸Henry VII.

England on the 30th of October 1485; and, to heighten the splendor on that occasion, he bestowed the rank of knights-banneret on 12 persons, and conferred peerages on three. Jasper earl of Pembroke, his uncle, he created duke of Bedford; Thomas Lord Stanley his father-in-law, earl of Derby; and Edward Courtenay, Earl of Devonshire. At the coronation likewise appeared a new institution, which the king had established for personal security as well as pomp; a band of 50 archers, who were denominated Yeomen of the Guard. But lest the people should take umbrage at this step, as if it implied a diffidence of his subjects, he declared the institution to be perpetual. The ceremony of the coronation was performed by Cardinal Bourchier archbishop of Canterbury.—On the 18th of January 1486, he was married to the Princess Elizabeth; and his marriage was celebrated at London with greater appearance of joy than either his first entry or his coronation had been. Henry remarked, with much displeasure, this general favour borne to the house of York; and the suspicions arising from it, not only disturbed his tranquillity during the whole of his reign, but bred disgust towards his consort herself, and poisoned all his domestic enjoyments.

The reign of Henry VII. was for several years disturbed by plots and insurrections. The people, by a long course of civil war, had become so turbulent and factious, that no governor could rule, nor could any king please them. The violent animosity expressed by this monarch, however, against the house of York, ²³⁹justly be considered as one of the causes of the extreme ^{His reign}proneness to rebellion manifested by his subjects. ^{disturbed}In-rebellious. ^{by frequent}stead of endeavouring to conciliate the affections of the opposite party, he always strove to quell them by absolute force and violence. For this purpose he took a journey, soon after his accession, to the north of England, where the Yorkists were very numerous; hoping to get the better of them by his presence. In his journey thither, he received intelligence of an insurrection against him by Viscount Lovel, with Sir Henry ²⁴⁰Stafford, and Thomas his brother, who had raised an ^{Lovel and}army, and were marching to besiege the city of Worcester. ^{Stafford's}center, while Lovel approached to assist them with a suppressed body of three or four thousand men. They were dispersed, however, by the offer of a general pardon; which induced Lovel to withdraw from his troops, who were thereupon obliged to submit to the king's mercy. The Staffords took sanctuary in the church of Colham near Abingdon; but as it was found that this church had not the privilege of protecting rebels, they were taken from thence: the elder was executed at Tyburn; but the younger, pleading that he had been misled by his brother, received a pardon.

This success was soon after followed by the birth of Prince Ar- ²⁴¹thur born. a prince; whom Henry named in honour of the celebrated king Arthur, who is said to have been the direct ancestor of the house of Tudor. All this success, however, as well as the general satisfaction which the birth of a prince defended from the houses both of

England. York and Lancaster necessarily occasioned, were not sufficient to reconcile the hearts of the English to their sovereign. His extreme severity towards the house of York still continued; and unfortunately this was much more beloved by the generality of the nation, than that of Lancaster. Many of the Yorkists had been treated with great cruelty, and deprived of their fortunes under pretence of treason; a general resumption had likewise been made of the grants made by the princes of the house of York. It was likewise universally believed that the queen herself met with harsh treatment, on account of her being one of that unfortunate house; and, from all these circumstances, it was not unreasonably imagined that his enmity was inveterate and invincible. Hence, notwithstanding his politic and vigorous administration, people made no scruple of openly expressing their disapprobation of his conduct and government; and one rebellion seemed to be extinguished only to give birth to another. The king had, at the commencement of his reign, confined the duke of Clarence's son, as has already been mentioned. This unfortunate youth, who had obtained the title of the earl of Warwick, was, through long confinement, entirely unacquainted with the affairs of the world. Simple as he was, however, he was now made use of to disturb the public tranquillity. The queen-dowager was with great reason suspected to be at the bottom of this conspiracy; but not choosing to interfere openly in the matter herself, she employed one Simon a priest of Oxford to execute her purposes. This man cast his eyes upon one Lambert Simnel a baker's son in the same place, a youth of only 15 years of age; but who, from his graceful appearance and accomplishments, seemed proper for personating a man of quality. A report had been spread among the people, that Richard duke of York, second son of Edward IV. had secretly made his escape from the cruelty of his uncle, and lay somewhere concealed in England. Simon had at first instructed his pupil to assume that name, which he found to be much the object of public affection; but hearing afterwards a new report, that Warwick had escaped from the Tower, and observing that this news was attended with no less general satisfaction, he changed the plan of his imposture, and made Simnel personate that unfortunate prince. The pliant youth was therefore directed by his instructor to talk upon many occurrences, as happening to him in the court of Edward. But as the imposture was not calculated to bear a close examination, he was removed to Ireland; and so well had he profited by the lessons given him, that he no sooner presented himself to the earl of Kildare the deputy, claiming his protection as the unfortunate earl of Warwick, than he began to consult with several other noblemen with regard to him. These expressed even a stronger belief in Simnel's story than the deputy himself had done; and in proportion as the story was spread abroad, the more credit it obtained. The impostor was lodged in the castle of Dublin; the inhabitants universally took an oath of allegiance to him, as the true descendant of the Plantagenets; he was crowned with a diadem taken from the statue of the blessed virgin, and proclaimed king by the title of Edward VI.; and the whole kingdom followed the example of the capital.

Such an unexpected event alarmed Henry so much,

that he would have gone over to Ireland on purpose to quell the rebellion in person, had he not been afraid of the machinations of the queen-dowager in his absence. To prevent any thing of this kind, it was resolved to confine her for life in a monastery; under pretence, however, that it was done on account of her having formerly delivered up the princess her daughter to King Richard. The queen murmured against the severity of her treatment; but the king persisted in his resolution, and she remained in confinement till the time of her death, which happened some years after.

The next measure was to show Warwick to the people. He was taken from the Tower, and led thro' the principal streets of London; after which he was conducted in solemn procession to St Paul's, where great numbers were assembled to see him. Still, however, they proceeded in Dublin to honour their pretended monarch; and he was crowned with great solemnity in the presence of the earl of Kildare, the chancellor, and the other officers of state. At last, being furnished by the duchess of Burgundy with a body of 2000 veteran Germans under the command of Martin Swart, a brave and experienced officer, he resolved to invade England. He landed in Lancashire, from whence he marched to York, expecting that the country-people would rise and join him on his march. But in this he was deceived: the people were unwilling to join a body of foreigners; and were besides kept in awe by the great reputation of Henry. Lord Lincoln, therefore, who commanded the rebel army, determined to bring the matter to a speedy issue. Accordingly he met the royal army at Stoke in the county of Nottingham. An oblique engagement ensued, but at length King Henry obtained a complete victory. Lord Lincoln, with 4000 private men, perished in the battle; and Simnel with his tutor Simon were taken prisoners. Simon being a priest, could not be tried by the civil power, and was only committed to close confinement. Simnel was pardoned, and made a scullion in the king's kitchen, whence he was afterwards advanced to the rank of falconer, in which employment he died.

Henry being now freed from all danger from that quarter, determined to take ample vengeance on his enemies. For this purpose he took a journey into the north; but though he found many delinquents, his natural avarice prompted him to exact heavy fines from them rather than to put them to death. His proceedings, however, were extremely arbitrary; the criminals being tried, not by the ordinary judges, but either by commissioners appointed for the occasion, or suffering punishment by sentence of a court-martial. Having thus fully established his authority as far as it could be done by suppressing and punishing domestic enemies, he next determined to recommend himself to his subjects by a report of his military disposition; hoping, that by undertaking, or pretending to undertake, some martial enterprises, he would thus gain the favour of a people naturally turbulent, and unaccustomed to live long at peace with their neighbours. He certainly had not, however, the least intention of prosecuting foreign conquests; though, to please the people, he frequently gave out that he designed to invade France, and lay waste the whole country, rather than not recover his continental possessions. Under these pretences, particularly that of assisting the Bretons whom the

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Imposture
of Robert
Simnel.

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Henry pu-
nishes his
enemies.

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Pretends a
desire of at-
chieving
martial ex-
ploits.

England.

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Obtains a
subsidy on
pretence of
assisting the
inhabitants
of Bretagne

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An insur-
rection
suppressed.

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Henry
makes a
feigned in-
vasion of
France.

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Obtains a
sum of mo-
ney and an-
nual pen-
sion.

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In picture
of Perkin
Warbeck.

king of France had lately subdued, and who had applied to him for relief, he persuaded his parliament to grant him a considerable supply; but this involved him in some difficulties. The counties of Durham and York, who had always been discontented with Henry's government, and still farther provoked by the oppressions under which they had laboured after the extinction of Simnel's rebellion, opposed the commissioners sent by the king to levy the tax. The latter applied to the earl of Northumberland, requesting his advice and assistance in the execution of their office; but instead of being able to enforce the levying of the tax, he himself was attacked and put to death by the insurgents. This act of violence committed by themselves, seemed to render the insurgents desperate, so that without more ado they prepared to resist the royal power, under the conduct of one Sir John Egremont; but in this ill-conducted and precipitate scheme they met with no success. Henry instantly levied a considerable force, which he committed to the charge of the earl of Surrey; by whom the rebels were quickly defeated, and one of their leaders taken prisoner. Sir John Egremont fled to the duchess of Burgundy, who afforded him protection.

Thus Henry obtained the subsidy which he had solicited under pretence of invading France, though he would willingly have avoided any expence in preparations for that purpose in order to keep the money in his possession; but as the Bretons had applied to him for assistance, and their distresses became every day more urgent, he found himself obliged to attempt something. With this view he set sail for Calais with an army of 25,000 foot and 1600 horse, of which he gave the command to the duke of Bedford and the earl of Oxford; but notwithstanding this apparent hostile disposition, negotiations for peace had been secretly begun, and commissioners even appointed to consider of the terms, three months before King Henry set out for the continent. As the love of money was the prevailing passion of the English monarch, and the possession of Bretagne was a great object to France, an accommodation soon took place betwixt the contending parties. The king of France engaged to pay Henry near £.200,000 as a reimbursement for the expences of his expedition, and stipulated at the same time to pay him and his heirs an annual pension of 25,000 crowns more.

Thus the authority of Henry seemed to be so firmly established, as to leave no reason to dread any rival in time to come; but still he found himself mistaken. The duchess of Burgundy, resenting the depression of her family, and exasperated by her frequent misadventures in the attempts already made, resolved to make a final effort against Henry, whom she greatly hated. For this purpose, she propagated a report that her nephew Richard Plantagenet, duke of York, had escaped from the Tower where his elder brother was murdered, and that he still lay somewhere concealed. Finding this report eagerly received, she soon found a young man who assumed both his name and character. The person chosen to act this part was the son of one Osbeck, or Warbeck, a converted Jew, who had been in England during the reign of Edward IV. His name was *Peter*; but it had been corrupted after the Flemish manner into *Peterkin*, or *Perkin*. It was by some

believed, that Edward, among his other amorous adventures, had a secret correspondence with Warbeck's wife, which might account for the great similarity of features between Perkin and that monarch. The duchess of Burgundy found this youth entirely suited to her purposes. The lessons she gave him were easily learned and strongly retained. His graceful air, his courtly address, his easy manners, and elegant conversation, were capable of imposing upon all but those who were privy to the imposture. The kingdom of Ireland was pitched upon for Perkin's first appearance, as it had been before for that of Simnel. He landed at Cork; and immediately assuming the name of *Richard Plantagenet*, was followed by great numbers of credulous people. He wrote letters to the earls of Desmond and Kildare, inviting them to join his party; he dispersed every where the strange intelligence of his escape from his uncle Richard's cruelty; and his story meeting with general credit, he soon became an object of the public favour. All those who were disgusted with the king, prepared to join Perkin; but particularly those who formerly were Henry's favourites, and had contributed to place him on the throne. These, thinking their services had not been sufficiently repaid, now became heads of the conspiracy. Their attempts, however, were all frustrated by the vigilance of the king, and most of the conspirators of any note were publicly executed.

Perkin finding it was in vain to attempt any thing in England, went to the court of James IV. of Scotland. Here he was received with great cordiality; and James carried his confidence in him so far, that he even gave him in marriage lady Catherine Gordon, daughter to the earl of Huntley, and a near kinswoman of his own. But when he attempted to set him on the throne of England, he found himself totally disappointed; and on the conclusion of peace between the two kingdoms, Perkin was obliged to leave Scotland. From thence he went to Flanders; and meeting with but a cool reception there, he resolved to try the affections of the people of Cornwall, who had lately risen against the king on account of a new tax which had been levied upon them. On his first appearance, Perkin was joined by about 3000 of these people, with which force he laid siege to Exeter. Henry, however, having marched against him with a considerable army, Perkin's heart failed him, though his followers now amounted to 7000; and he took shelter in a monastery. His wife fell into the conqueror's hands; who placed her in a respectable situation near the queen's person, with a suitable pension, which she enjoyed till her death. Perkin being persuaded to deliver himself into the king's hand, was compelled to sign a confession of his former life and conduct; but this was so defective and contradictory, that very little regard was paid to it. His life was granted him; though he was still detained in custody, and keepers were appointed to watch his conduct. From these, however, he broke loose; and flying to the sanctuary of Shyne, put himself into the prior's hands. He was once more prevailed upon to trust himself in the king's hands, and was committed to the Tower; but having here entered into a correspondence with the earl of Warwick in order to make their escape, both of them were condemned and executed.

To Henry VII. in a great measure is owing the

England.

England,

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English na-
tion civi-
lized by
Henry.

present civilized state of the English nation. He had all along two points principally in view; the one to depress the nobility and clergy, and the other to exalt and humanize the populace. In the feudal times every nobleman was possessed of a certain number of vassals, over whom he had, by various methods, acquired an almost absolute power; and, therefore, upon every slight disgust, he was able to influence them to join him in his revolt or disobedience. Henry considered, that the giving of his barons a power to sell their estates, which were before unalienable, must greatly weaken their interest. This liberty therefore he gave them; and it proved highly pleasing to the commons, nor was it disagreeable to the nobles themselves. His next scheme was to prevent their giving liveries to many hundreds of their dependents, who were thus kept like the soldiers of a standing army to be ready at the command of their lord. By an act passed in this reign, none but menial servants were allowed to wear a livery; and this law was enforced under severe penalties.

With the clergy, Henry was not so successful. The number of criminals of all kinds who found protection in monasteries and other places appointed for religious worship, seemed to indicate little less than an absolute toleration of all kinds of vice. Henry used all his interest with the pope to get these sanctuaries abolished, but to no purpose. All that he could procure was, that if thieves, murderers, or robbers, registered as sanctuary men, should fall out and commit fresh offences, and retreat again, in such cases they might be taken out of the sanctuary and delivered up to justice.

In 1500, the king's eldest son Arthur was married to the Infanta Catharine of Spain, which marriage had been projected and negotiated seven years. But the prince dying in a few months after marriage, the princess was obliged to marry his younger brother Henry, who was created Prince of Wales in his room. Henry himself made all the opposition which a youth of 12 years of age is capable of; but as the king persisted in his resolution, the marriage was by the pope's dispensation shortly after solemnized.—In the latter part of this king's reign, his economy, which had always been exact, degenerated into avarice, and he oppressed the people in a very arbitrary manner. He had two ministers, Empson and Dudley, perfectly qualified to second his avaricious intentions. They were both lawyers, and usually committed to prison by indictment such persons as they intended to oppress; from whence they seldom got free but by paying heavy fines, which were called mitigations and compositions: but by degrees the very forms of law were omitted; and they determined in a summary way upon the properties of the subjects, and confiscated their effects to the royal treasury.—Henry VII. died of the gout in his stomach, in the year 1509, having lived 52 years, and reigned 23; and was succeeded by his son Henry VIII. In Henry VII.'s reign was built a large ship of war called the *Great Harry*, which cost £. 14,000. This was, properly speaking, the first ship in the English navy. Before this period, when the king wanted a fleet, he had no other expedient than to hire ships from the merchants.

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Death of
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Henry VIII.

Henry VIII. ascended the throne when he was a-

bout 18 years of age, and had almost every advantage which a prince can have on his accession. He had a well-stored treasury, an indisputed title, and was at peace with all the powers in Europe. Commerce and arts had been some time introduced into England, where they met with a favourable reception. The young prince himself was beautiful in his person, expert in all polite exercises, open and liberal in his air, and loved by all his subjects. The old king, who was himself a scholar, had instructed him in all the learning of the times, so that he was an adept in school-divinity before the age of 18.

All these advantages, however, seemed to have been lost upon the new king. Being destitute of a good heart and solid understanding, he proved a tyrant. Being always actuated not by reason but the passion which happened to be uppermost in his mind, he behaved in the most absurd and contradictory manner; and however fortunate some of his measures proved at last, it is impossible that either his motives, or the means he took for the accomplishment of his purposes, can be approved of by any good man.

One of Henry's first actions in his royal capacity was to punish Empson and Dudley, who were obnoxious to the populace on account of their having been the instruments of the late king's rapacity. As they could not be impeached merely on account of their having strictly executed the will of the king, they were accused of having entered into a treasonable conspiracy, and of having designed to seize by force the administration of government; and though nothing could be more improbable than such a charge, the general prejudice against them was so great, that they were both condemned and executed.

In 1510, the king entered into a league with pope Julius II. and Ferdinand king of Spain, against Louis XII. of France. In this alliance Henry was the only disinterested person. He expected nothing besides the glory which he hoped would attend his arms, and the title of *Most Christian King*, which the pope assured him would soon be taken from the king of France to be conferred upon him. The pope was desirous of wresting from Louis some valuable provinces which he possessed in Italy, and Ferdinand was desirous of sharing in the spoil. Henry summoned his parliament; who very readily granted him supplies, as he gave out that his design was to conquer the kingdom of France, and annex it to the crown of England. It was in vain that one of his old prudent counsellors objected, that conquests on the continent would only drain the kingdom without enriching it; and that England, from its situation, was not fitted to enjoy extensive empire. The young king, deaf to all remonstrances, and hurried away by his military ardour, resolved immediately to begin the war. But after several attempts, which were rendered unsuccessfully by the mismanagement of those who conducted them, a peace was concluded with France on the 7th of August 1514.

Henry's arms were attended with more success in Scotland; where King James IV. with the greatest part of the Scot's nobility, and 10,000 of the common people, were cut off in the battle of Flowden*. Henry * See Scot's in the mean time, puffed up with his imaginary suc-
cesses against France, and his real ones against Scot-
land,

England.

England.

land, continued to lavish his treasures by expensive pleasures and no less expensive preparations for war. The old ministers who had been appointed by his father to direct him, were now disregarded; and the king's confidence was entirely placed in Thomas afterwards Cardinal Wolsey, who seconded him in all his favourite pursuits, and who, being the son of a private gentleman at Ipswich, had gradually raised himself to the first employments of the state*. He doth not seem to have had many bad qualities besides his excessive pride, which disgusted all the nobility; but the great share he possessed in the favour of such an absolute prince as Henry VIII. put him quite out of the reach of his enemies.

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Cardinal
Wolsey
minister.

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Arbitrary
behaviour
of the king

The king having soon exhausted all the treasures left him by his father, as well as the supplies which he could by fair means obtain from his parliament, applied to Wolsey for new methods of replenishing his coffers. The minister's first scheme was to get a large sum from the people under the title of *benevolence*; though no title could be more improperly applied, as it was not granted without the greatest murmurs and complaints. Wolsey even met with opposition in the levying of it. In the first place, having exacted a considerable sum from the clergy, he next applied himself to the house of commons; but they only granted him half the sum he demanded. The minister at first was highly offended, and desired to be heard in the house; but they replied, that none could be permitted to sit and argue there except such as were members. Soon after, the king having occasion for new supplies, by Wolsey's advice attempted to procure them by his prerogative alone, without consulting his parliament. He issued out commissions to all the counties of England for levying four shillings in the pound from the clergy, and three shillings and fourpence from the laity. This stretch of royal power was soon opposed by the people, and a general insurrection seemed ready to ensue. Henry endeavoured to pacify them by circular letters; in which he declared, that what he demanded was only by way of *benevolence*. The city of London, however, still hesitated on the demand; and in some parts of the country insurrections were actually begun. These were happily suppressed by the duke of Suffolk; but the cardinal lost somewhat of the king's favour on account of the improper advice he had given him. To reinstate himself in his good graces, Wolsey made the king a present of a noble palace called *York-place*, at Westminster, assuring him that from the first he had intended it for the king's use. In order to have a pretence for amassing more wealth, Wolsey next undertook to found two new colleges at Oxford; and for this purpose he received every day fresh grants from the pope and the king. The former imprudently gave him liberty to suppress some monasteries, and make use of their revenues for the erection of his new colleges; but this was a fatal precedent for the pontiff's interests, as it taught the king to seize on the monastic revenues whenever he stood in need of money.

For a considerable time Wolsey continued to enjoy the king's favour in an extreme degree; and as no monarch was ever more despotic than Henry VIII. no minister was ever more powerful than Wolsey. This extraordinary elevation served only to render his fall the more conspicuous, and himself the more miserable,

when it took place; and what was worse, he had long foreseen, from what he knew of the king's capricious and oblique temper, that it certainly would happen one time or other. The cause of his final overthrow was the desire King Henry began to entertain of having his Queen Catherine divorced. The doctrines of the reformation, propagated by Luther in 1517, had gained considerable ground in England, and many professed a belief in them, notwithstanding the severe persecution which had been carried on against heretics during some of the preceding reigns. The clergy had become so exceedingly corrupt, and were immersed in such monstrous ignorance, that they were universally hated even by their own party, while no regard at all was paid to their decisions, or rather they were looked upon with the utmost abhorrence, by the reformers. Even the papal authority, though still very great, had, in no greater a space of time than ten years (viz. from 1517, when Luther first began to attack it, to the present year 1527), declined very sensibly. The marriage of King Henry therefore being in itself looked upon by all parties as illegal in itself, and only sanctified by a dispensation from the pope, had been frequently objected to on different occasions. We are informed by some authors, that when Henry VII. betrothed his son, at that time only 12 years of age, he evidently showed an intention of taking afterwards a proper opportunity to annul the contract; and that he ordered Prince Henry, as soon as he should come of age, to enter a protestation against the marriage; charging him on his death-bed not to finish an alliance so unusual, and liable to such insuperable objections. Some members of the privy council, particularly Warham the primate, afterwards declared against the completion of the marriage; and even after it was completed, some incidents which in a short time took place were sufficient to make him sensible of the general sentiments of the public on that subject. The states of Castile had opposed a marriage betwixt the emperor Charles and the English princess Mary, Henry's daughter, urging among other things the illegitimacy of her birth. The same objection afterwards occurred on opening a negotiation with France for a marriage with the duke of Orleans.

If these accounts are to be depended upon as authentic, we can scarce conceive it possible but Henry himself must have been somewhat staggered by them; though it is by no means probable that they were his only motives. The queen was six years older than the king, her personal charms were decayed, and his affection lessened in proportion. All her children had died in infancy except one daughter, the Princess Mary above mentioned; and Henry was, or pretended to be, greatly struck with this, as it seemed something like the curse of being childless, pronounced in the Mosaic law against some evil-doers. Another point of the utmost importance was the succession to the crown, which any question concerning the legitimacy of the king's marriage would involve in confusion. It was also supposed, with great reason, that should any obstacles of this kind occur, the king of Scotland would step in as the next heir, and advance his pretensions to the crown of England. But above all, it is probable that he was influenced by the love he had now contracted for Anne Boleyn, who had

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Cause of
Wolsey's
disgrace.

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Scruples
concerning
the legality
of Henry's
marriage.

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Other rea-
sons for
Henry's de-
sire of a di-
vorce.

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His love for
Anne Bo-
leyn.

England. lately been appointed maid of honour to the queen. In this station Henry had frequent opportunities of seeing her, and soon became deeply enamoured; and finding that his passion could not be gratified but by a marriage, it is not to be doubted that he was thus obstinately set upon the divorce; for which purpose he sent his secretary to Rome to obtain from Clement a bull for dissolving his marriage with Catharine. That he might not seem to entertain any doubt of the pope's prerogative, he insisted only on some grounds of nullity in the bull granted by his predecessor Julius for the accomplishment of the marriage. In the preamble to this bull, it had been said, that it was granted only upon the solicitation of Henry himself; though it was known that he was then a youth under 12 years of age: it was likewise asserted, that the bull was necessary for maintaining the peace between the two crowns; though otherwise it is certain that there was no appearance of a quarrel betwixt them. These false premises seemed to afford a very good pretence for dissolving it; but, as matters then stood, the pope was involved in the utmost perplexity. Queen Catharine was aunt to the emperor, who had lately made Clement himself a prisoner, and whose resentment he still dreaded: and besides, he could not with any degree of prudence declare the bull of the former pope illicit, as this would give a mortal blow to the doctrine of papal infallibility. On the other hand, Henry was his protector and friend; the dominions of England were the chief resource from whence his finances were supplied; and the King of France, some time before, had got a bull of divorce in circumstances nearly similar. In this exigence he thought the wisest method would be to spin out the affair by negotiation; and in the mean time he sent over a commission to Wolsey, in conjunction with the archbishop of Canterbury or any other English prelate, to examine the validity of the king's marriage and of the former dispensation; granting them also a provisional dispensation for the king's marriage with any other person.

The pope's message was laid before the council in England: but they considered, that an advice given by the pope in this secret manner might very easily be disavowed in public; and that a clandestine marriage would totally invalidate the legitimacy of any issue the king might have by such a match. In consequence of this, fresh messengers were dispatched to Rome, and evasive answers returned; the pope never imagining that Henry's passion would hold out during the tedious course of an ecclesiastical controversy. But in this he was mistaken. The king of England had been taught to dispute as well as the pope, and valued himself not a little in his knowledge on theology: and to his arguments he added threats; telling him, that the English were but too well disposed to withdraw from the holy see; and that if he continued uncomplying, the whole country would readily follow the example of their monarch, who should always deny obedience to a pontiff that had treated him with such falsehood and duplicity. The king even proposed to him his holiness, whether, if he were not permitted to divorce his present queen, he might not have a dispensation for having two wives at once?

The pope, perceiving the king's eagerness, at last sent Cardinal Campeggio his legate to London; who,

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with Wolsey, opened a court for trying the legitimacy of the king's marriage with Catharine, and cited the king and queen to appear before them. The trial commenced the 31st of May 1529; and both parties presented themselves. The king answered to his name when called: but the queen, instead of answering to hers, rose from her seat, and throwing herself at the king's feet, made a very pathetic harangue; which her dignity, her virtue, and misfortunes, rendered still more affecting. She told her husband, "That she was a stranger in his dominions, without protection, without counsel, and without assistance; exposed to all the injustice which her enemies were pleased to impose upon her: That she had quitted her native country, without any other resource than her connections with him and his family; and that, instead of suffering thence any violence or iniquity, she had been assured of having in them a safeguard against every misfortune: That she had been his wife during 20 years; and would here appeal to himself, whether her affectionate submission to his will had not merited other treatment than to be thus, after so long a time, thrown from him with indignity: That she was conscious,—he himself was assured,—that her virgin honour was yet untailed when he received her into his bed; and that her connections with his brother had been carried no farther than the mere ceremony of marriage: That their parents, the kings of England and Spain, were esteemed the wisest princes of their time, and had undoubtedly acted by the best advice when they formed the agreement for that marriage, which was now represented as so criminal and unnatural: And that she acquiesced in their judgment, and would not submit her cause to be tried by a court whose dependence on her enemies was too visible ever to allow her any hopes of obtaining from them an equitable or impartial decision." Having spoken these words, the queen rose, and, making the king a low reverence, left the court; nor would she ever again appear in it. The legate having again summoned the queen to appear before them, on her refusal, declared her contumacious, and the trial proceeded in her absence. But when the business seemed to be nearly decided, Campeggio, on some very frivolous pretences, prorogued the court, and at last transferred the cause before the see of Rome.

All this time Cardinal Wolsey seemed to be in the same dilemma with the pope, and indeed much worse; as he could not boast of the same independence which Cardinal his holiness possessed. On the one hand, he was very solicitous to gratify the king his master, who had distinguished him by so many and extraordinary marks of favour; on the other, he feared to offend the pope, whose servant he more immediately was, and who likewise had power to punish his disobedience. He had long known that this affair was certainly to end in his ruin; and by attempting to please all parties, he fell under the displeasure of every one; so that he was at last left without a single friend in the world. The king was displeased on account of his not entering into his cause with the warmth he thought he had reason to expect; Anne Boleyn imputed to him the disappointment of her hopes; while even queen Catharine and her friends expressed the greatest indignation against him on account of the part he had openly taken in the affair of her divorce. In this miserable situation the king

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obtain a di-
vorce.

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Extreme
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Henry's
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queen be-
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and per-
secuted.

king sent him a message by the dukes of Norfolk and Suffolk, demanding the great seal: the cardinal refused to deliver it without a more express warrant; upon which Henry wrote him a letter, and on receipt of this it was instantly given up. The seal was bestowed on Sir Thomas More; a man who, besides elegant literary talents, was possessed of the highest capacity, integrity, and virtue. Wolsey was next commanded to depart from York-place palace which he had built in London; and which, though it belonged to the see of York, was now seized by the king, and afterwards became the residence of the British sovereigns, under the name of *Whitehall*. All his furniture and plate, the richness of which seemed rather proper for a monarch than a subject, was seized for the king's use. He was then commanded to retire to Eltham, a country-seat which he possessed near Hampton court, and there to wait the king's pleasure. One disgrace followed another; and his fall was at length completed by a summons to London to answer a charge of high-treason. This summons he at first refused to answer, as being a cardinal. However, being at length persuaded, he set out on his journey; but was taken ill, and died by the way. See the article *WOLSEY*.

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of Europe
consulted
about the
legality of
the king's
marriage.
See *Cran-
mer*.

After the death of Wolsey, the king, by the advice of *Cranmer*, had the legality of his marriage debated in all the universities of Europe; and the votes of these were obtained in his favour by dint of money. The disbursements made on the occasion have even been preserved to this day. To a subdeacon he gave a crown, to a deacon two crowns, and so to the rest in proportion to the importance of their station or opinion.—Being thus fortified by the opinions of the universities, and even of the Jewish rabbies (for them also he had consulted), Henry began to think he might safely oppose the pope himself. He began by reviving in parliament an old law against the clergy, by which all those who had submitted to the authority of the pope's legate were condemned to severe penalties. The clergy, to conciliate the king's favour, were obliged to pay a fine of 118,000 pounds. A confession was likewise extorted from them, that the king, and not the pope, was the supreme head of the church and clergy of England. An act was soon after passed against levying the first-fruits, or a year's rent of all the bishoprics that fell vacant. After this the king privately married his beloved Anne Boleyn; and she proving with child soon after marriage, he publicly owned her for his wife, and passed with her through London, with a greater magnificence than had ever been known before. The streets were strewed with flowers, the walls of the houses hung with tapestry, and an universal joy seemed to be diffused among the people. The unfortunate queen Catharine, perceiving all further opposition to be vain, retired to Amplehill near Dunstable, where she continued the rest of her days in privacy and peace. Her marriage with Henry was at last declared invalid, but not till after the latter had been married to Anne Boleyn, though this declaration ought undoubtedly to have preceded it. See *BOLEYN*.

The pope was no sooner informed of these proceedings, than he passed a sentence, declaring Catharine to be the king's only lawful wife; requiring him to take her again, and denouncing his censures against him in case of a refusal. Henry, on the other hand, knowing

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church.

that his subjects were entirely at his command, resolved to separate totally from the church of Rome. In the year 1534, he was declared head of the church by parliament; the authority of the pope was completely abolished in England; all tributes formerly paid to the holy see were declared illegal; and the king was entrusted with the collation to all ecclesiastical benefices. The nation came into the king's measures with joy, and took an oath called the *oath of Supremacy*: all the credit which the popes had maintained over England for ages, was now overthrown at once; and none seemed to repine at the change, except those who were immediately interested by their dependence on Rome.

But though the king thus separated from the church of Rome, he by no means adhered to the doctrines of Luther which had been lately published. He had written a book against this celebrated reformer, which the pope pretended greatly to admire; and honoured King Henry, on its account, with the title of "Defender of the faith." This character he seemed to be determined to maintain, and therefore persecuted the reformers most violently. Many were burnt for denying the popish doctrines, and some also were executed for maintaining the supremacy of the pope. The courtiers knew not which side to take, as both the new and old religions were equally persecuted; and as both parties equally courted the favour of the king, he was by that means enabled to assume an absolute authority over the nation. As the monks had all along shown the greatest resistance to Henry's ecclesiastical character, he resolved at once to deprive them of the power of injuring him. He accordingly empowered *Cromwell*, secretary of state, to send commissioners into the several counties of England to inspect the monasteries; and to report, with rigorous exactness, the conduct and deportment of such as were found there. This employment was readily undertaken by some creatures of the court, whose names were Layton, London, Price, Gage, Petre, and Belasis. They are said to have discovered monstrous disorders in many of the religious houses; whole convents of women abandoned to all manner of lewdness; friars accomplices in their crimes; pious frauds every where committed, to increase the devotion and liberality of the people; and cruel and inveterate factions maintained between the inhabitants. Thus a general horror was excited against these communities; and therefore the king, in 1536, suppressed the lesser monasteries, amounting to 376 in number. Their revenues, computed at 32,000 pounds a-year, were confiscated to the king's use; besides their plate and other goods, computed at 100,000 pounds more. In 1538, the greater monasteries also were demolished. The better to reconcile the people to this great innovation, stories were published, perhaps with aggravations, of the detestable lives which the friars led in their convents. The reliques also, and other objects of superstitious veneration, were now brought forth, and became objects of derision to the reformers. A great number of these are enumerated by Protestant writers; such as the parings of St Edmund's toes; some of the coals that roasted St Laurence; the girdle of the Virgin Mary, shown in no fewer than eleven different places; two or three heads of St Ursula; the felt of St Thomas of Lancaster, an infallible cure for the headach; part of St Thomas of Canterbury's shirt,

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much revered among big-bellied women; some reliques, an excellent preservative against rain, others against weeds in corn; &c. Some impostures, however, were discovered, which displayed a little more ingenuity in the contrivance. At Hales in the county of Gloucester had been shown, during several ages, the blood of Christ brought from Jerusalem. The veneration for this precious relique may easily be imagined; but it was attended with a most remarkable circumstance not observed in any other reliques. The sacred blood was not visible to any one in mortal sin, even when set before him; nor could it be discovered till he had performed good works sufficient for his absolution. At the dissolution of the monastery, the whole contrivance was discovered. Two of the monks who were let into the secret, had taken the blood of a duck, which they renewed every week: they put it into a phial, one side of which was thin and transparent crystal, the other thick and opaque. When any rich pilgrim arrived, they were sure to show him the dark side, till masses and offerings had expiated his offences; after which they made him happy, by turning the phial. — A miraculous crucifix had been kept at Boxely in Kent, and bore the appellation of the *rood of grace*. The lips, eyes, and head of the image, moved on the approach of its votaries. Helsey bishop of Rochester broke the crucifix at St Paul's cross, and showed to all the people the springs and wheels by which it had been secretly moved. A great wooden idol, called *Darvel Gatherin*, was also brought to London and cut in pieces: and, by a cruel refinement of vengeance, it was employed as fuel to burn Friar Forest; who was punished for denying the king's supremacy, and for some pretended heresies. A finger of St Andrew, covered with a thin plate of silver, had been pawned for a debt of 40 pounds; but as the king's commissioners refused to release the pawn, people made themselves very merry with the poor creditor on account of his security. On this occasion also was demolished the noted shrine of Thomas a Becket, commonly called *St Thomas of Canterbury* *. The riches of it were inconceivable when broken down; the gold with which it was adorned filled two large chests that eight strong men could scarce carry out of the church. The king, on the whole, suppressed 645 monasteries, of which 28 had abbots who enjoyed a seat in parliament. Ninety colleges were demolished in several counties; 2374 chantries and free chapels, and 110 hospitals. The whole revenue of these establishments amounted to 161,100 pounds.

* See
Becket.

It is easy to imagine the indignation which such an uninterrupted course of sacrilege and violence would occasion at Rome. In 1535, the king had executed Bishop Fisher, who was created a cardinal while in prison, and Sir Thomas More, for denying or speaking ambiguously about his supremacy. When this was reported in Italy, numerous libels were published all over the country, comparing the king of England to Nero, Domitian, Caligula, and the most wicked tyrants of antiquity. Clement VII. died about six months after he had threatened the king with a sentence of excommunication; and Paul III. who succeeded him in the Papal throne, entertained some hopes of an accommodation. But Henry was so much accustomed to domineering, that the quarrel was soon rendered totally

incurable. The execution of Fisher was reckoned such a capital injury, that at last the pope passed all his censures against the king, citing him, and all his adherents to appear in Rome within 90 days, in order to answer for their crimes. If they failed, he excommunicated them; deprived the king of his realm; subjected the kingdom to an interdict; declared his issue by Anne Boleyn illegitimate; dissolved all leagues which any Catholic princes had made with him; gave his kingdom to any invader; commanded the nobility to take up arms against him; freed his subjects from all oaths of allegiance; cut off their commerce with foreign states; and declared it lawful for any one to seize them, to make slaves of their persons, and to convert their effects to his own use. But though these censures were then passed, they were not openly denounced. The pope delayed the publication till he should find an agreement with England totally desperate, and till the emperor, who was then hard pressed by the Turks and the Protestant princes of Germany, should be in a condition to carry the sentence into execution. But in 1538, when news arrived at Rome that Henry had proceeded with the monasteries as above related, the pope was at last provoked to publish the censures against him. Libels were again dispersed, in which he was anew compared to the most furious persecutors of antiquity, and the preference was now given on their side. Henry, it was said, had declared war with the dead, whom the Pagans themselves respected; was at open enmity with heaven; and had engaged in professed hostility with all the saints and angels. Above all, he was reproached with his resemblance to the emperor Julian, whom (it was said) he imitated in his apostasy and learning, though he fell short of him in his morals. But these terrible fulminations had now lost their effect. Henry had long ago denied the supremacy of the Pope, and therefore had appealed from him to a general council; but now, when a general council was summoned at Mantua, he refused to be subject to it, because it was called by the pope, and lay entirely under subjection to that spiritual usurper. He engaged his clergy to make a declaration to the like purpose, and prescribed to them many other alterations with regard to their ancient tenets and practices. It was expected that the spirit of His absurd opposition to the church of Rome would have at last made him fall in with the doctrines of the reformed; but though he had been gradually changing the theological system in which he was educated, ever since he came to the years of maturity, he was equally positive and dogmatical in the few articles he retained, as tho' the whole fabric had continued entire and unshaken; and though he stood alone in his opinion, the flattery of courtiers had so much inflamed his tyrannical arrogance, that he thought himself intitled to regulate by his own particular standard, the religious faith of the whole nation. The point on which he chiefly rested his orthodoxy was the most absurd in the whole Popish doctrine, namely, that of transubstantiation. All departure from this he held to be a damnable error; and nothing, he thought, could be more honourable for him, than, while he broke off all connections with the Roman pontiff, to maintain, in this essential article, the purity of the Catholic faith.

In 1539, a parliament was called, which met on the 28th day of April. The chancellor opened this

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parliament by informing the House of Lords, that it was his majesty's earnest desire to extirpate from his kingdom all diversity of opinions with regard to religion; and as this enterprise was, he owned, difficult and important, he desired them to choose a committee from among themselves, who might frame certain articles, and communicate them afterwards to parliament. The lords named the vicar-general Cromwell, now created a peer, the archbishops of Canterbury and York, the bishops of Durham, Carlisle, Worcester, Bath and Wells, Bangor and Ely. This small committee itself was agitated with such diversity of opinions, that it could come to no conclusion. The Duke of Norfolk then moved, that since there was no hope of having a report from the committee, the articles of faith proposed to be established should be reduced to fix, and a new committee be appointed to frame an act with regard to them. As this peer was understood to speak the king's mind, his motion was immediately complied with; and after a short prorogation, the bill of the six articles, or the *bloody bill*, as the Protestants justly termed it, was introduced; and having passed the two houses, received the king's assent. By this law the doctrine of the real presence was established; the communion in one kind; the perpetual obligation of vows of chastity; the utility of private masses; the celibacy of the clergy; and the necessity of auricular confession. The denial of the real presence subjected the person to death by fire, and to the same forfeiture as in cases of treason; and admitted not the privilege of abjuring: an unheard-of cruelty, unknown even to the inquisition itself. The denial of any of the other articles, even though recanted, was punishable by the forfeiture of goods and chattels, and imprisonment during the king's pleasure: an obdurate adherence to error, or a relapse, was adjudged to be felony, and punishable by death. The marriage of priests was subjected to the same punishment. Their commerce with women, was, for the first offence, forfeiture and imprisonment; and for the second, death. Abstaining from confession, and from receiving the eucharist at the accustomed times, subjected the person to fine, and to imprisonment during the king's pleasure; and if the criminal persevered after conviction, he was punishable by death and forfeiture, as in cases of felony. Commissioners were to be appointed by the king for inquiring into these heresies and irregular practices, and the criminals were to be tried by a jury.

The parliament having thus surrendered their ecclesiastical privileges, next proceeded to surrender their civil ones also. They gave to the king's proclamations the same force as to statutes enacted by parliament, and thus by one blow made a total subversion of the English constitution; and to render the matter worse, if possible, they framed this law as if it were only declaratory, and intended to explain the natural extent of the royal authority.—Notwithstanding this, however, they afterwards pretended to make some limitations in the regal power; and they enacted, that no proclamation should deprive any person of his lawful possessions, liberties, inheritances, &c. nor yet infringe any common law or laudable custom of the realm.

As soon as the act of the six articles had passed, the Catholics were extremely vigilant to inform against of-

fenders; and, in a short time, no fewer than 500 persons were thrown into prison. But some of the chief officers of state remonstrating against the cruelty of punishing such a number of delinquents, they were all of them set at liberty; and soon after this, Henry, as if he had resolved to give each party the advantage by turns, granted every one permission to have a translation of the Bible, which had been newly made, in his family.

In 1540, the king again complained to parliament of the great diversity of religious tenets which prevailed among his subjects; a grievance, he affirmed, which ought the less to be endured, because the scriptures were now published in England, and ought universally to be the standard of belief to mankind. But he had appointed, he said, some bishops and divines to draw up a list of tenets; and he was determined that Christ and the truth should have the victory; whence he seems to have expected more from this new book of his doctors, than had ensued from the publication of the scriptures. Cromwell, as vicar-general, also made a speech in the upper house; and the peers in return told him, that he deserved to be vicar-general to the universe: To such a degree of mean and servile submission was the English parliament at this time reduced.

This year also the king suppressed the only religious order remaining in England; namely, the knights of the St John of Jerusalem, or the *knights of Malta*, as they are commonly called. This order had by their valour done great service to Christendom; and had very much retarded, at Jerusalem, Rhodes, and Malta, the rapid progress of the barbarians. During the general surrender of the religious houses in England, they had obdutely refused to give up their revenues to the king; and Henry, who would endure no society that professed obedience to the pope, was obliged to have recourse to parliament for the dissolution of this order. Their revenues were large, and formed a considerable addition to the acquisitions which the king had already made. But he had been such a bad economist, that, notwithstanding the immense plunder afforded him by the church, he now demanded from parliament a very considerable supply. The commons, however, though lavish of the blood of their fellow-subjects, were extremely frugal of their money; and it was not without murmuring that the grant could be obtained, even by this absolute and dreaded monarch.

The king all this time continued to punish with unrelenting severity the Protestants who offended against the law of the six articles, and the Papists who denied his supremacy; which gave occasion to a foreigner at that time to say, that those who were against the Pope were burned, and those who were for him were hanged. The king even seemed to display in an ostentatious manner his tyrannical justice and impartiality which reduced both parties to subjection. This year he executed three Protestants and three Papists coupled together. The latter declared, that the most grievous part of their punishment was the being coupled to such heretical miscreants as suffered with them.

In 1542, Henry proceeded to the further dissolution of colleges, hospitals, and other foundations of ^{colleges, hospitals, &c.} that nature. The courtiers had been dealing with the presidents and governors to make a surrender of their

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revenues to the king; and they had succeeded with eight. But there was an obstacle to their farther progress: it had been provided by the local statutes of most of these foundations, that no president nor any fellows could make such a deed without the unanimous consent of all the fellows. This consent would not have been easily obtained; but the parliament proceeded in a summary manner to annul all these statutes; by which means the revenues of those houses were exposed to the rapacity of the king and his favourites. Henry also now extorted from many bishops a surrender of their chapter-lands; by which means he pillaged the sees of Canterbury, York, and London, and enriched his favourites with their spoils. He engaged the parliament to mitigate the penalties of the six articles, as far as regarded the marriage of priests, which was now only subjected to a forfeiture of goods, chattels, and lands during life: he was still equally bent on maintaining a rigid purity in speculative principles. He had appointed a commission consisting of two archbishops and several bishops of both provinces, together with a considerable number of doctors of divinity; and by virtue of his ecclesiastical supremacy he had charged them to choose a religion for his people. Before the commissioners, however, had made any progress in this arduous undertaking, the parliament had passed a law by which they ratified all the tenets which these divines should establish with the king's consent; and thus they were not ashamed of declaring expressly that they took their religion upon trust, and had no other rule either in religious or temporal concerns than the arbitrary will of their master. One clause of the statute, however, seems to favour somewhat of the spirit of liberty. It was enacted, that the ecclesiastical commissioners should establish nothing repugnant to the laws and statutes of the realm. But in reality this proviso was inserted by the king, to serve his own purposes. By introducing a confusion and contradiction into the laws, he became more the master of every one's life and property; and as the ancient independence of the church still gave him jealousy, he was well pleased, under colour of such a clause, to introduce appeals from spiritual to civil courts. For the same reason he would never promulgate a body of canon law; and he encouraged the judges on all occasions to interpose in ecclesiastical causes, wherever they thought the law or the prerogative concerned. Being thus armed by the authority of parliament, or rather by their acknowledgment of his spiritual supremacy, the king employed his commissioners to select a system of tenets for the assent and belief of the nation. A small volume was published, under the title of *The Institution of a Christian Man*, which was received by the convocation, and made the inflexible standard of orthodoxy. In this book the points of justification, faith, free-will, good works, and grace, were discussed in a manner somewhat favourable to the opinions of the reformers. The sacraments, which a few years before were only allowed to be three, were now increased to seven, conformably to the sentiments of the Catholics. Throughout the whole of this book the king's caprice is very discernible; and the book is in reality to be regarded as his composition. For Henry, while he made his opinion a rule for the nation, would himself submit to no authority whatever; not even to any which he had formerly established. The

same year the people had a farther instance of the king's inconsistency. He ordered a new book to be composed, called the *Erudition of a Christian Man*; and without asking the consent of the convocation, he published by his own authority this new model of orthodoxy. He was no less positive in his new creed than he had been in the old one; but though he required the faith of the nation to veer about at his signal, he was particularly careful to inculcate the doctrine of passive obedience in all his books, and he was no less careful to retain the nation in the practice.

But while the king was thus spreading his own books among the people, both he and the clergy seem to have been very much perplexed with regard to the scriptures. A review had been made by the ecclesiastical synod of the new translation of the Bible; and Bishop Gardiner had proposed, that instead of employing English expressions throughout, several Latin words should still be preserved, because they contained, as he pretended, such peculiar energy and significance, that they had no correspondent terms in the English tongue. Among these were *ecclesia*, *penitentia*, *pontifex*, *coarctatus*, &c. But as this mixture would appear extremely barbarous, and was plainly calculated for no other purpose than to retain the people in their ancient ignorance, the proposal was rejected. The knowledge of the people, however, seemed to be still more dangerous than their ignorance; and the king and parliament, soon after the publication of the scriptures, retracted the concession which they had formerly made, and prohibited all but gentlemen and merchants to peruse them. Even that liberty was not granted without an apparent hesitation, and dread of the consequences. These persons were allowed to read, *so it be done quietly and with good order*. And the preamble to the act sets forth, "That many seditious and ignorant persons had abused the liberty granted them of reading the Bible; and that great diversity of opinion, animosities, tumults, and schisms, had been occasioned by perverting the sense of the scriptures." The mass-book also passed under the king's examination; but little alteration was yet made in it. Some doubtful or fictitious saints only were struck out; and the name of the pope was erased. The latter precaution was also used with every new book that was printed, and even every old one that was sold. The word *pope* was carefully omitted or blotted out; as if that precaution could abolish the term from the language, or cause the people forget that such a person existed. About this time also, the king prohibited the acting of plays, interludes, and farces, in derision of the Popish superstitions; which the Protestants had been in use to practise; and this prohibition was in the highest degree pleasing to the Roman Catholics.

In this tyrannical and head strong manner Henry proceeded with regard to ecclesiastical affairs. In other respects his conduct was equally violent. With regard to his domestic concerns, history scarce affords his parallel. We have already taken notice of his extreme love for Anne Boleyn, whom he married, contrary even to his own principles, before the marriage with Catharine was dissolved. His affection for the former was carried to such an height, that he even procured an act excluding from the succession the issue of Queen Catharine, in favour of the children of Anne

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Henry's love for Jane Seymour the true cause of Anne Boleyn's death.

Anne Boleyn; and failing them to the king's heirs for ever. An oath to this purpose was likewise enjoined, under penalty of imprisonment during the king's pleasure, and forfeiture of goods and chattels. All slander against the king and his new queen or their issue, was subjected to the penalty of treason or misprision of treason. The reason given for this extreme severity toward his own child was, that her mother had obstinately refused to quit the kingdom, notwithstanding all the methods he could take to induce her to do so. The oath was generally taken throughout the kingdom; Sir Thomas More the chancellor, and Fisher bishop of Rochester, being the only persons who refused; for which both of them were imprisoned, and soon after executed. The unfortunate queen Catharine died, in her retreat at Amphythill, in the year 1536. On her death-bed she wrote a most pathetic letter to the king, in which she forgave him all the injuries she had received, and recommended to him in the strongest terms their daughter the princess Mary. This letter affected Henry so much, that he could not read it without tears; but the new queen is said to have exulted in such a manner on hearing of the death of her rival, as was quite inconsistent with either decency or humanity. Her triumph, however, was of short duration. Henry had no sooner possessed her, secure from every disquieting thought by the death of queen Catharine, than his passion began to decline; and to this her delivery of a dead son did not a little contribute; for so impetuous and absurd were his passions, and such was his desire for male issue, that the disappointment in this respect alone was sufficient to alienate his affection from his wife. The levity of her temper, and her extreme gaiety of behaviour bordering upon licentiousness, as related under the article *BOLEYN*, also gave an opportunity to her enemies of enflaming the king's jealousy against her. The viscountess of Rocheford, in particular, a woman of profligate manners, and who was married to the queen's brother, had the cruelty to report to the king that her husband committed incest with his own sister; and, not content with this, she interpreted every instance of favour shown by her to a man, as proof of a criminal intercourse between them. At the same time it must not be forgot, that he who insisted on such rigid fidelity from his wives, was himself the most faithless of mankind. He had doubts, it may be allowed, about the legality of his marriage with Queen Catharine, but his doubts were evidently confirmed by the charms of Anne Boleyn. After being fatigued with the possession of her for six years, perhaps he really doubted her fidelity; but here again his doubts were confirmed by the beauty of Jane Seymour, with whom he had now fallen in love. It may easily be believed, that from this consideration alone there was no reason to hope that ever the unfortunate Anne would be able to exculpate herself. Had the really been guilty, her monster of a husband might have allowed her to live; but his cruelty was as unbounded and insatiable as his other perverse passions. She was condemned; and the sentence pronounced against her was, that she should be burned or beheaded at the king's pleasure. On hearing this dreadful denunciation, she exclaimed, "O Father! O Creator! thou who art the way, the truth, and the life! thou knowest that I have not deserved this fate." She then made the most solemn protestations of inno-

cence before her judges; but these, as they had been from the beginning ineffectual, so it was not to be supposed that they could now avail any thing. Anne was beheaded by the executioner of Calais, who was reckoned more expert than any in England; and Henry enjoyed the pleasure of marrying his beloved Jane Seymour. His satisfaction, however, was of no long continuance: for the queen, becoming pregnant immediately after marriage, died in two days after the birth of the child; who being a son, was baptised by the name of Edward VI. As this lady had been more beloved by Henry than any of his other wives, his grief for the loss of her was extreme. However, it did not hinder him from entering very soon afterwards into a new matrimonial scheme; in which he met with many difficulties. His first proposals were made to the duchess dowager of Milan, niece to the emperor and to Catharine his own former queen; but as he had behaved so indifferently to the aunt, it is scarce to be supposed that his addresses could prove agreeable to the niece. On this he demanded the duchess-dowager of Longueville, daughter of the duke of Guise; but on making the proposal to the French monarch, Francis I. he was informed that the princess had been already betrothed to the king of Scotland. Henry, however, would take no refusal. He had learned that the object of his affection was endowed with many accomplishments, was very beautiful, and of a large size, which last property he looked upon to be necessary for him who was now become somewhat corpulent himself. Francis, to prevent any more solicitations on this subject, sent the princess to Scotland, but at the same time made Henry an offer of Mary of Bourbon, daughter of the Duke of Vendosme. This princess was rejected by Henry, because he had heard of her being formerly refused by the king of Scotland. He was then offered his choice of the two younger sisters of the queen of Scotland, both of them being equal in merit as well as size to the one whom he had desired; but Henry, unwilling to trust to any reports concerning the beauty of these ladies, or even to their pictures, proposed to Francis, that they should have a conference at Calais under pretence of business, and that the latter should bring with him the two princesses of Guise with the finest ladies of quality in France, that he might make a choice. This indecise proposal shocked Francis; he returned for answer, that he was too much impressed with regard for the fair-sex to carry ladies of the first quality, like geldings, to a market, to be chosen or rejected according to the humour of the purchaser. Henry remonstrated and stormed as usual; but though Francis at this time earnestly wished to oblige him, he at last totally rejected the proposal. Negotiations were then entered into for a German match; and the princess of Cleves was proposed by Cromwell, on account of the great interest her father had with the Protestant princesses of Germany. Henry had also become enamoured of her person from a picture of her he had seen; but this, tho' drawn by an eminent artist, was unluckily done so much to the advantage, that when the negotiation was quite finished, and the bride arrived in England, he lost all patience, swearing that she was a great Flanders mare, and that he could never bear her the smallest affection. The matter was still worse, when he found that she could

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Marriage of Cleves.

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could speak no language but Dutch, of which he was entirely ignorant. Notwithstanding all these objections, however, he resolved to complete the marriage, telling Cromwell, that since he had gone so far, he must now put his neck into the yoke. The reason of this was, that the friendship of the German princes was now more than ever necessary for Henry; and it was supposed that the affront of sending the princes back to her own country might be repented. Cromwell, who knew that his own life depended on the event of the matter, was very anxious to learn from the king how he liked his spouse after having passed a night with her; but was struck with terror when he replied that he now hated her more than ever; that he was resolved not to cohabit with her, and even suspected that she was not a virgin; a matter in which he pretended to be a *connoisseur*, and about which he was extremely scrupulous. In a little time his aversion increased to such a degree, that he determined at any rate to get rid of his queen and prime minister both at once. Cromwell had long been an object of aversion to the nobility, who hated him on account of his obscure birth; his father being no other than a blacksmith, though the son had obtained the first employments in the kingdom. By his office of vicar-general, he had an almost absolute authority over the clergy; he was also lord privy-seal, lord-chamberlain, and master of the wards. He had also been invested with the order of the garter, and was created earl of Essex. This was sufficient to raise the envy of the courtiers: but he had also the misfortune to fall under the displeasure of both Protestants and Papists; the former hating him on account of his concurrence with Henry in their persecution, and the latter looking upon him as the greatest enemy of their religion. To these unfortunate circumstances on the part of Cromwell, was added the usual situation of Henry himself, who had now fallen in love with Catharine Howard, niece to the Duke of Norfolk; to enjoy whom, he now determined to divorce Anne of Cleves. By the insinuations of this lady and her uncle, Cromwell's ruin was accomplished; and he was condemned, not only without any trial, but even without examination. The charge was of heresy and high treason; but the instances of the latter were quite absurd and ridiculous. He submitted, however, to his sentence without murmuring, as knowing that his complaints on this subject would be revenged on his son. He was terribly mangled by the executioner before his head could be struck off. His death was soon followed by the dissolution of the marriage with the princess of Cleves, which was annulled by the consent of both parties. The princess parted from him with great indifference; and accepted of £. 3000 a-year as a compensation, but refused to return to her own country after the affront she had received.

285
The marriage annulled and Cromwell put to death.

286
Henry falls in love with Catharine Howard.

287
Infidelity and death of the new queen.

The king's marriage with Catharine Howard soon followed the dissolution of that with Anne of Cleves; but the event may surely be regarded as a providential punishment upon this tyrant, whose cruelty, lust, and other bad qualities, can scarcely be matched in history. We have already mentioned his insinuations against the virtue of the unfortunate princess of Cleves, were amply repaid by the actual infidelities of his new queen,

whom we must suppose he believed to be a pure and perfect virgin at the time he married her. So happy indeed did he imagine himself in this new marriage, that he publicly returned thanks for his conjugal felicity, when a most unfortunate information concerning the queen's incontinence was given to Crammer by one of the name of Lascelles, whose sister had been servant to the duchess-dowager of Norfolk. He not only gave intelligence of her amours before marriage, but affirmed that she had continued the same criminal practices ever since. Two of her paramours were arrested, and confessed their crimes: the queen herself also confessed guilt before marriage, but denied having ever been false to the king's bed; which, however, had very little probability. She was beheaded on Tower-hill, along with the viscountess of Rochford, who had been a confidant in her amours. The latter, as has already been observed, was a principal instrument in procuring the destruction of the unhappy Anne Boleyn, and therefore died unpitied; while the virtuous character of that unfortunate lady received an additional confirmation from the discovery of this woman's guilt.

To secure himself from any farther disasters of this kind, Henry passed a most extraordinary law, ²⁸⁸ Abfurdity of the king, enacting that any one who should know, or strongly suspect any guilt in the queen, might, within 20 days, disclose it to the king or council, without incurring the penalty of any former law against defaming the queen; though at the same time every one was prohibited from spreading the matter abroad, or even privately whispering it to others. It was also enacted, that if the king married any woman who had been incontinent, taking her for a true maid, he should be guilty of treason if he did not previously reveal her guilt to him.

These laws afforded diversion to the people, who now said that the king must look out for a widow; as no reputed maid would ever be persuaded to incur the penalty of the statute. This in truth happened to be the case at last; for about a year after the death of Catharine Howard, he married, for his sixth wife, Catharine Parr, widow of Nevil Lord Latimer. This lady, being somewhat inclined to the doctrines of the reformation, and having the boldness to tell her husband her mind upon the subject, had like to have shared the fate of the rest. The furious monarch, incapable of bearing the least contradiction, instantly complained to Bishop Gardiner, who inflamed the quarrel as much as possible; so that at last the King consented that articles of impeachment should be drawn up against her. But these were rendered abortive by the prudence and address of the queen, as related under the article PARR.

All this time Henry had tyrannized over his nobility in the most cruel manner. The old counts of Salisbury, the last of the house of Plantagenet, was executed with circumstances of great cruelty. She had been condemned, as usual, without any trial; and when she was brought to the scaffold, refused to lay her head on the block in obedience to a sentence, to the justice of which she had never consented. She told the executioner, therefore, that if he would have her head, he must win it the best way he could; and thus she ran about the scaffold, pursued by the executioner, ²⁹⁰ Monstrous cruelty of the king.

England.

288
Abfurdity of the king.

289
Sixth marriage with Catharine Parr, who intended to share the fate of the rest.

290
Monstrous cruelty of the king.

England.

England.

291
Attainder
of Norfolk
and Surry.

tioners, who aimed many fruitless blows at her neck before he was able to put an end to her life. Soon after her, the lord Leonard Grey was likewise executed for treason, but we have very little account of this transaction.

The last instances of the king's injustice and cruelty were the duke of Norfolk and his son the earl of Surry. The former had served the king with fidelity, and the latter was a young man of the most promising hopes. His qualifications, however, were no security against the violence of Henry's temper. He had dropped some expressions of resentment against the king's ministers, who had displaced him from the government of Boulogne; and the whole family had become obnoxious on account of the late Queen Catharine Howard. From these motives, orders were given to arrest both the father and son; and accordingly they were arrested both on the same day, and confined to the Tower. The duchess-dowager of Richmond, Surry's own sister, was among the number of his accusers; and Sir Richard Southwell also, his most intimate friend, charged him with infidelity to the king. Surry denied the charge, and challenged his accuser to a single combat. This favour was denied him; and, notwithstanding his eloquent and spirited defence, he was condemned and executed at Tower-hill.—The duke of Norfolk vainly endeavoured to mollify the king by letters and submissions. An attainder was found against him, though the only crime his accusers could allege was, that he had once said that the king was sickly, and could not hold out long; and that the kingdom was likely to be torn between the contending parties of different persuasions. Cranmer, though engaged for many years in an opposite party to that of Norfolk, and though he had received many and great injuries from him, would have no hand in such an unjust prosecution; but retired to his seat at Croydon. The death-warrant, however, was made out, and immediately sent to the lieutenant of the Tower; but a period was put to the cruelties and violence of the king by his death, which happened on the 14th of January 1547, the night before Norfolk was to have been executed.

292
Henry dies,
and is suc-
ceeded by
Edward VI.

Henry was succeeded by his only son Edward, a boy of nine years of age. The most remarkable transactions of his reign are those with regard to religion. The restraint which Henry VIII. had laid upon the Protestants was now taken off; and they not only maintained their doctrines openly, but soon became the prevailing party. Henry had fixed the majority of his son at 18 years of age; and, in the mean time, appointed 16 executors of his will, to whom, during the minority, he entrusted the government of the king and kingdom. This will, he imagined, would be obeyed as implicitly after his death as though he had been alive. But the first act of the executors was to choose the earl of Hertford, afterwards duke of Somerset, protector of the realm; and in him was lodged all the regal power, together with a privilege of naming whom he pleased for his privy council.

293
Reforma-
tion com-
pleted.

The duke of Somerset had long been reckoned a secret partisan of the reformers; and, immediately on his elevation to his present high dignity, began to express his intention of reforming the abuses of the ancient religion. Under his direction and that of Cran-

mer, therefore, the reformation was carried forward and completed. The only person of consequence who opposed the reformers was Gardiner bishop of Winchester; and, to the disgrace of their own principles, the reformers now showed that they could persecute as severely as the Papists had formerly persecuted them. Gardiner was committed to the Fleet prison, where he was treated with great severity. He was afterwards sent to the Tower; and having continued there two years, he was commanded to subscribe several articles, among which was one confessing the justice of his own imprisonment. To all the articles but this he agreed to subscribe; but that did not give satisfaction. He was then committed to close custody; his books and papers were seized; all company was denied him, and he was not even permitted the use of pen and ink. The bishops of Chichester, Worcester, and Exeter, were in like manner deprived of their offices; but the bishops of Landaff, Salisbury, and Coventry, escaped by sacrificing the most considerable share of their revenues. The libraries of Westminster and Oxford were ordered to be ransacked, and purged of the Romish legends, missals, and other superstitious volumes; in which search, great devastation was made even in useful literature. Many volumes clasped in silver were destroyed for the sake of their rich bindings; many of geometry and astronomy were supposed to be magical, and destroyed on that account; while the members of the university, unable to put a stop to these ravages, trembled for their own safety.

294
The reform-
ers perse-
cute the ca-
tholics.

The reformers, however, were not contented with severities of this kind. A commission was granted to the primate and others, to search after all Anabaptists, heretics, or contemners of the new liturgy. Among the numbers who were found guilty upon this occasion, was one Joan Boucher, commonly called *Joan of Kent*; who was so very obnoxious, that the commissioners could make no impression upon her. She maintained an abstruse metaphysical sentiment, that Christ, as man, was a sinful man; but, as the Word, he was free from sin, and could be subject to none of the frailties of the flesh with which he was clothed. For maintaining this doctrine, the poor woman was condemned to be burnt to death as an heretic. The young king, who it seems had more sense than his teachers, refused at first to sign the death-warrant: but at last, being overcome by the importunities of Cranmer, he reluctantly complied; declaring, that if he did wrong, the sin should be on the head of those who had persuaded him to it. The primate, after making another unsuccessful effort to reclaim the woman from her opinions, committed her to the flames. Some time after, one Van Paris, a Dutchman, was condemned to death for Arianism. He suffered with so much satisfaction, that he hugged and caressed the faggots that were consuming him.

The rest of this reign affords only the history of intrigues and cabals of the courtiers one against another. The protector was first opposed by his own brother admiral Sir Thomas Seymour, who had married Catharine Parr the late king's widow. She died soon after the marriage; and he then made his addresses to the princess Elizabeth, who is said not to have been averse to the match. His brother the duke, who was at that time in the north, being informed of his

England.

his ambitious projects, speedily returned, had him attainted of high treason, and at last condemned and executed. The duke of Somerset himself, however, was some time afterwards deprived of his office by Dudley duke of Northumberland; who at last found means to get him accused of high treason, and executed. Not satisfied with the office of protector, which he assumed on the death of Somerset, this ambitious nobleman formed a scheme of engrossing the sovereign power altogether. He represented to Edward, who was now in a declining state of health, that his sisters Mary and Elizabeth, who were appointed by Henry's will to succeed, in failure of direct heirs, to the crown, had both been declared illegitimate by parliament; that the queen of Scots his aunt, stood excluded by the king's will; and, being an alien also, lost all right of succeeding. The three princefles being thus excluded, the succession naturally devolved to the marchioness of Dorset eldest daughter of the French queen, Henry's sister, who had married the earl of Suffolk after her first husband's death. The next heir to the marchioness was Lady Jane Gray, a lady universally respected, both on account of the charms of her person, and the virtues and endowments of her mind. The king, who was accustomed to submit to the politic views of this minister, agreed to have the succession submitted to council, where Northumberland hoped to procure an easy concurrence. The judges, however, who were appointed to draw up the king's letters patent for this purpose, warmly objected to the measure; and gave their reasons before the council. They begged that a parliament might be summoned, both to give it force, and to free its partisans from danger: they said that the form was invalid, and would not only subject the judges who drew it, but every counsellor who signed it, to the pains of treason. Northumberland could not brook their demurs; he threatened them with his authority, called one of them a *traitor*, and said he would fight with any man in his shirt in such a just cause as that of Lady Jane's succession. A method was therefore found out of screening the judges from danger, by granting them the king's pardon for what they should draw up; and at length the patent for changing the succession was completed, the princefles Mary and Elizabeth were set aside, and the crown settled on the heirs of the duchess of Suffolk (for she herself was contented to forego her claim.)

For some time the king had languished in a consumption. After this settlement of the crown, his health visibly declined every day, and little hopes were entertained of his recovery. To make matters worse, his physicians were dismissed by Northumberland's advice, and by an order of council; and he was put into the hands of an ignorant old woman, who undertook in a little time to restore him to health. After the use of her medicines all his bad symptoms increased to the most violent degree. He felt a difficulty of speech and breathing; his pulse failed, his legs swelled, his colour became livid, and many other signs of approaching death marked her appearance. He expired at Greenwich on the 6th of July 1553, in the 16th year of his age and 7th of his reign.

After the death of King Edward, very little regard was paid to the new patent by which Lady Jane Gray

had been declared heir to the throne. The undoubted title of Mary, notwithstanding the scandalous behaviour of her father and his servile parliaments, was acknowledged by the whole nation. Northumberland, however, was resolved to put the late king's will in execution. He therefore carefully concealed the death of Edward, in hopes of securing the person of Mary, who by an order of council had been required to attend her brother during his illness; but the being informed of his death, immediately prepared to assert her right to the crown. Northumberland then, accompanied by the duke of Suffolk, the earl of Pembroke, and some other noblemen, saluted Lady Jane Gray queen of England. Jane was in a great measure ignorant of these transactions, and it was with the utmost difficulty she was persuaded to accept of the dignity conferred upon her. At last she complied, and suffered herself to be conveyed to the Tower, where it was then usual for the sovereigns of England to pass some days after their accession. Mary, however, who had retired to Kenning-hall in Norfolk, in a very few days found herself at the head of 40,000 men; and Lady Jane resigned the sovereignty in ten days, with much more pleasure than she had received it. She retired with her mother to their own habitation; and Northumberland finding his affairs quite desperate, attempted to quit the kingdom. But he was stopped by the band of pensioner guards, who informed him that he must stay to justify their conduct in taking arms against their lawful sovereign. He therefore surrendered himself to Mary; and was soon after executed, together with Sir John Gates and Sir Thomas Palmer, two infamous tools of his power. Sentence was also pronounced against Lady Jane Gray and her husband Lord Guildford; but without any intention of putting it in execution against them at present, as their youth and innocence pleaded so strongly in their favour, neither of them having yet reached their 17th year.

Mary now entered London, and was peaceably settled on the throne without any effusion of blood. The English, however, soon found reason to repent their queen's attachment to her cause. Though she had at first solemnly promised to defend the religion and laws of her predecessor, she no sooner saw herself firmly established on the throne, than she resolved to restore the Popish religion, and give back their former power to the clergy. Gardiner, Bonner, and the other bishops who had been imprisoned or suffered loss during the last reign, were taken from prison, reinstated in their sees, and now triumphed in their turn. On pretence of discouraging controversy, the queen by her prerogative silenced all preachers throughout England, except such as should obtain a particular license, and this she was resolved to give only to those of her own persuasion. The greater part of the foreign Protestants took the first opportunity of leaving the kingdom; and many of the arts and manufactures, which they had successfully introduced, fled with them. Soon after, the queen called a parliament, which seemed willing to concur in all her measures. They at once repealed all the statutes with regard to religion that had passed during the reign of Edward VI. and the national religion was again placed on the same footing in which it had been at the death of Henry VIII.

To strengthen the cause of the Catholics, and give

295
Lady Jane
Gray declared
her heir to
the crown.

England.

297
Lady Jane
Gray placed
on the throne,
but is forced to
resign it.

298
Mary declared
queen.

296
Death of
Edward VI.

England. the queen more power to establish the religion to which she was so much attached, a proper match was to be sought for her; and it was supposed that three had already been proposed as candidates for her favour. Her affection seemed to be engaged by the earl of Devonshire; but as he was rather attached to the Princess Elizabeth, he received the overtures which were made him from the queen with neglect. The next person mentioned as a proper match for her was Cardinal Pole, a man greatly respected for his virtues; but as he was now in the decline of life, Mary soon dropped all thoughts of that alliance. At last she cast her eye on Philip II. of Spain, son to the Emperor Charles V. He was then in the 27th year of his age, and consequently agreeable in that respect to Mary, who was in her 48th year; but when her intentions with regard to this match became known, the greatest alarm took place throughout the whole nation. The commons presented such a strong remonstrance against a foreign alliance, that the queen thought proper to dissolve the parliament in order to get quit of their importunity. To obviate, however, all clamour, the articles of marriage were drawn up as favourably as possible for the interests of England. It was agreed, that though Philip should have the title of king, the administration should be entirely in the queen; that no foreigner should be capable of holding any office in the kingdom; nor should any innovation be made in the laws, customs, and privileges of the people; that Philip should not carry the queen abroad without her consent, or any of her children without the consent of the nobility. Sixty thousand pounds a-year were to be settled upon her as a jointure; and the male issue of this marriage were to inherit Burgundy and the Low Countries as well as the crown of England: and in case of the death of Don Carlos, Philip's son by his former marriage, without any heir, the queen's issue should inherit all the rest of the Spanish dominions also.

All these concessions, however, were not sufficient to quiet the apprehensions of the people: they were considered merely as words of course, which might be retracted at pleasure; and the whole nation murmured loudly against a transaction so dangerous to its ancient liberty and independence. An insurrection was raised by Sir Thomas Wyatt, a Roman Catholic, at the head of 4000 men, who set out from Kent to London, publishing a declaration against the Spanish match and the queen's evil counsellors. Having advanced as far as Southwark, he required that the queen should put the Tower of London into his hands; and that she should deliver four counsellors as hostages; that, in order to ensure the liberty of the nation, should marry an Englishman. But his force was at present by far too small to support such magnificent pretensions; and he unluckily waited so much time without attempting any thing of importance, that the popular ferment entirely subsided, his followers abandoned him gradually, and he was at last obliged to surrender himself to Sir Maurice Berkeley near Temple-bar. His followers were treated with great cruelty, no fewer than 400 of them suffering by the hand of the executioner; 400 more were conducted with ropes about their necks into the queen's presence, and there received their

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England. pardon. Wyatt himself was condemned and executed.

This rebellion had almost proved fatal to the Princess Elizabeth, who for some time past had been treated with great severity by her sister. Mary, who possessed a most malignant and cruel heart, had never forgotten the quarrel between their mothers; and when a declaration was made after her own accession, recognising Queen Catharine's marriage as legal, he was thus furnished with a pretence for accounting Elizabeth illegitimate. She was likewise obnoxious on account of her religion, which Elizabeth at first had not prudence sufficient to conceal; though afterwards she learned full well to disguise her sentiments. But above all, her standing so high in the affection of the Earl of Devonshire, was a crime not to be forgiven; and Mary made her sensible of her displeasure by numberless mortifications. She was ordered to take place at court after the Duchess of Suffolk and the Countess of Lennox; to avoid which, and other indignities, Elizabeth at last retired from court altogether into the country. After the suppression of Wyatt's rebellion she was committed to the Tower, and underwent a strict examination before the council; but as Wyatt had made a declaration on the scaffold that she was in no manner of way concerned, the queen found herself under a necessity of releasing her. To get rid of such a troublesome rival, however, she was offered in marriage to the Duke of Savoy; and on Elizabeth's declining the proposal, she was committed close prisoner to Woodstocke. The rebellion proved fatal, however, to many persons of distinction, and gave the queen an opportunity of manifesting that unbounded cruelty which reigned in her heart. The Tower, and all the prisons in the kingdom, were filled with nobility and gentry, who became objects of royal vengeance, more on account of their credit and interest with the people than any concern they were supposed to have had with Wyatt. Sir Nicholas Throgmorton was tried in Guildhall; but as no satisfactory evidence appeared against him, the jury gave a verdict in his favour. The queen was so much enraged at this disappointment, that she recommended him to the Tower, summoned the jury before the council, and at last sent them all to prison, fining them afterwards some of 1000 l. and others of 2000 l. each. Sir John Throgmorton, brother to Sir Nicholas just mentioned, was condemned and executed upon evidence which had been already rejected as insufficient. But of all those who perished on this occasion, none excited more universal compassion than the unfortunate Lady Jane Grey and her husband Lord Guilford Dudley. They had already received sentence of death, as has been mentioned; and two days after the execution of Wyatt, they received orders to prepare for eternity. Lady Jane, who had been in expectation of this blow, was no way intimidated, but received the news with the most heroic resolution. The place intended at first for their execution was Tower-hill; but the council, dreading the effects of the people's compassion for their youth, beauty, and innocence, gave directions that they should be beheaded within the verge of the Tower. The duke of Suffolk was soon after tried, condemned, and executed; but would have met with more compassion, had not his

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England. ambition been the cause of his daughter's unhappy fate just mentioned. Sir Thomas Gray also lost his life on the same account; but the cruel spirit of Mary was still unsatisfied; and finding herself universally odious, that she might free herself from any apprehensions for what was past, as well as tyrannize with the more freedom in time to come, she disabled the people from resistance, by ordering general musters, and causing the commissioners seize their arms and lay them up in forts and castles.

305
The people
dismayed.

Notwithstanding this unpopularity, however, the rebellion of Wyatt had so strengthened the hands of government, that a parliament was assembled in hopes of gratifying the queen's wishes in regard to her marriage with Philip of Spain. To facilitate this purpose also, the emperor of Germany sent over to England 400,000 crowns to be distributed among the members of parliament in bribes and pensions; a practice of which there had hitherto been no example in England. The queen, notwithstanding her bigotry, resumed the title of *Supreme Head of the Church*, which she had dropped three months before. Gardiner made a speech, in which he proposed, that they should invest the queen with a legal power of disposing of the crown, and appointing her successor; but the parliament, however obsequious in other respects, did not choose to gratify their sovereign in a measure by which the kingdom of England might become a province of the Spanish monarchy. They would not even declare it treason to imagine or attempt the death of the queen's husband during her life-time, though they agreed to ratify the articles of marriage. Finding therefore that the parliament even yet was not sufficiently obsequious, it was thought most proper to dissolve them. Soon after this the marriage with Philip was solemnized; but as the latter had espoused his queen merely with a view to become king of England, he no sooner found himself disappointed in this than he showed a total want of affection for her as a wife. He passed most of his time at a distance from her in the Low Countries; and seldom wrote to her except when he wanted money, with which Mary would at all times gladly have supplied him even had it been at the expence of her kingdom, if in her power.

306
Marriage
with Philip
solemnized.

The enemies of the state being supposed to be suppressed, those of the Catholic religion were next persecuted. The old sanguinary laws which had been rejected by a former parliament were now revived. Orders were given, that the priests and bishops who had married should be ejected; that the monks should be restored, and the pope's authority established; and that the church and its privileges, all but their goods and estates, should be put on the same footing on which they were before the commencement of the reformation. But as the gentry and nobility had already divided the churchlands among them, it was thought inconvenient, and indeed impossible, to make a restoration of these. The persons who chiefly promoted these measures were Gardiner bishop of Winchester, and Cardinal Pole, who was a kinsman of Henry VIII. but had been long in Italy, and was now returned from it. The latter was for tolerating the Protestants; but the former, perceiving that rigorous measures would be most agreeable to the king and queen, declared himself against it. He was too prudent, however, to appear in person at the

head of the persecution; and therefore assigned that office to Bonner bishop of London, a man of a very abandoned character. The bloody scene began by the execution of Hooper bishop of Gloucester, and Rogers prebendary of St Paul's. These were quickly followed by others, of whom the principal were Archbishop Cranmer, Ridley bishop of London, and Latimer bishop of Worcester*. These persecutions soon became odious to the whole nation, and the perpetrators of them were all willing to throw the blame from themselves upon others. Philip endeavoured to fatten the whole reproach upon Bonner; but that bishop would not take the whole, and therefore retorted on the court. A bold step was now taken to introduce a court similar to the Spanish inquisition, that should be empowered to try heretics, and condemn them without any other law but its own authority. But even this was thought a method too dilatory in the present exigence of affairs. A proclamation issued against books of heresy, treason, and sedition, declared, that whosoever had such books in his possession, and did not burn them without reading, should suffer as a rebel. This was attended with the execution of such numbers, that at last the magistrates who had been instrumental in these cruelties refused to give their assistance any longer. It was computed, that during this persecution, 277 persons suffered by fire, besides those punished by imprisonments, fines, and confiscations. Among those who suffered by fire were 5 bishops, 21 clergymen, 8 lay-gentlemen, 84 tradesmen, 100 husbandmen, 55 women, and 4 children.

The only remarkable transaction which happened during this reign with regard to the temporal affairs of the kingdom was the loss of Calais, which had been in the possession of the English for upwards of 200 years*. This loss filled the whole kingdom with complaints, and the queen with grief. She was heard to say, that, when dead, the name of *Calais* would be found engraven on her heart. She did not long survive this loss; but died in the year 1558, of a lingering illness, after a reign of five years four months and eleven days.

England.

* See *Cranmer*, &c.

* See *Calais*.

308
Mary dies,
and is suc-
ceeded by
Elizabeth.

After the death of Mary, the Princess Elizabeth succeeded to the throne without opposition. She was at Hatfield when news of her sister's death were brought her; upon which she hastened up to London, where she was received with great joy. This princess was well qualified for government. She had judgment sufficient to make choice of proper ministers, and authority enough to keep her subjects in awe. The restraints also, to which she had been subjected during her sister's reign, had taught her so well to conceal her sentiments, that she had become a perfect mistress of dissimulation; which, though no commendable part of her character, proved occasionally of great service to her government. She perfected the reformation, and put the religion of England upon the same plan which subsists at present. This was accomplished without the least difficulty; for the persecutions in Mary's reign had served only to give the whole nation an aversion for popery. In the time of Edward VI. the people had been compelled to embrace the Protestant religion, and their fears induced them to conform; but now, almost the whole nation were Protestants from inclination. The reformation was confirmed by act of parliament in 1559, and thus.

307
Protestants
persecuted.

England. thus England was seen to change its religion four times in the space of 32 years.

309
Peace with France. During the time that the queen and her counsellors were employed in settling the religious affairs of the nation, negotiations were likewise carried on for a peace between England and France; which was at last concluded on the following terms, viz. that Henry should restore Calais at the expiration of eight years; that in case of failure, he should pay 500,000 crowns, and Elizabeth's title to Calais still remain; that for the payment of this sum he should find the security of eight foreign merchants, not natives of France; and until that security were provided he should deliver five hostages. If during this interval Elizabeth should break the peace with France or Scotland, she should forfeit all title to Calais; but if Henry made war on Elizabeth, he should be obliged to restore the fortresses immediately. This pacification was soon followed by an irreconcilable quarrel with Mary queen of Scotland; which was not extinguished but by the death of the Scottish prince; and that with such circumstances of accumulated treachery, hypocrisy, and dissimulation, as have stamped an indelible disgrace on the memory of Elizabeth. See the articles MARY and SCOTLAND.

310
Preparation for war with Spain. Elizabeth having at last got rid of her rival in the year 1587, began to make preparations for resisting the Spanish invasion. Hearing that Philip was secretly fitting out a great navy to attack her, she sent Sir Francis Drake with a fleet to pillage his coasts and destroy his shipping. On this expedition he set sail with four capital ships furnished by the queen, and 26 others of various sizes furnished him by the merchants of London in hopes of sharing the plunder. Having learned that a Spanish fleet richly laden was lying at Cadiz in readiness to set sail for Lisbon, he directed his course towards the former port, where he boldly attacked the enemy. Six galleys were obliged to take shelter under the cannon of the forts; he burned about 100 vessels laden with ammunition and naval stores; and destroyed a great ship belonging to the Marquis de Santa Croce. Thence setting sail for Cape St Vincent, he took by assault the castle situated on that promontory, with three other fortresses. Having next insulted Lisbon, he sailed to the Teneras, where after lying in wait for some time, he took a rich prize, and then returned to England; having by this short expedition taught the English to despise the huge and unwieldy ships of the enemy, and thus prepared them to act with more resolution against the formidable armament that now threatened to invade them.

313
Misfortune of Philip's scheme of an invasion. But though the expedition of Sir Francis Drake had retarded the intended invasion of England for a twelvemonth, it had not by any means induced Philip to abandon his design. During that interval he continued his preparations with the greatest activity, the more especially as the invasion of England seemed to be a necessary preparative for regaining his authority over the Netherlands, the revolted provinces having been strongly supported by Elizabeth. The fleet prepared at this time was superior to any thing then existing in the world; and no doubt being entertained of its success, it was ostentatiously styled the *Invincible Armada*. The miserable event of this expedition, and the total failure of all the mighty hopes of Philip, are related under the article ARMADA. The spirit and courage of the

English were now excited to attempt invasions in their turn; which they executed in numerous descents on the Spanish coasts; though these were only temporary, and designed not for permanent conquest, but to harass the enemy. It would be endless to relate all the advantages obtained over the enemy at sea, where the capture of every ship must have made a separate narrative. It is sufficient to observe, that the sea-captains of that reign are still considered as the boldest and most enterprising set of men that England ever produced; and among this number we are to reckon Raleigh and Howard, Drake, Cavendish, and Hawkins. The English navy then began to take the lead; and has since continued irresistible in all parts of the ocean.

Elizabeth continued to reign with great glory till the year 1603; but all her greatness could not prevent her from being extremely miserable before her death. She had caused her greatest favourite, and probably her lover, the earl of Essex *, to be executed. Though * See Dever's execution could not be called unjust, the queen's affection (on being informed that he had at last thrown himself entirely on her clemency) returned to such a degree, that she thenceforth gave herself entirely over to despair. She refused food and sustenance; she continued silent and gloomy; sighs and groans were the only vent she gave to her depondence; and she lay for ten days and nights upon the carpet, leaning on cushions, which her maids brought her. Perhaps the faculties of her mind were impaired by long and violent exercise; perhaps she reflected with remorse on some past actions of her life, or perceived, but too strongly, the decays of nature, and the approach of her dissolution. She saw her courtiers remitting in their assiduity to her, in order to pay their court to James the apparent successor. Such a concurrence of causes was more than sufficient to destroy the remains of her constitution; and her end was now visibly near to approach. Feeling a perpetual heat in her stomach, attended with an unquenchable thirst, she drank without ceasing, but refused the assistance of her physicians. Her distemper gaining ground, Cecil and the lord admiral desired to know her sentiments with regard to the succession. To this she replied, That as the crown of England had always been held by kings, it ought not to devolve upon any inferior character, but upon her immediate heir the king of Scotland. Being then advised by the archbishop of Canterbury to fix her thoughts upon God, she replied, that her thoughts did not in the least wander from him. Her voice soon after left her; she fell into a lethargic slumber, which continued some hours; and she expired gently without a groan, in the 70th year of her age, and 45th of her reign. She was succeeded by James I. king of Scotland; since which time, the history of both England and Scotland is comprehended under the article BRITAIN.

315
England, how divided into six circuits, each circuit containing a certain number of counties. Two judges are appointed for each circuit, which they visit in the spring and autumn, for administering justice to the subjects who are at a distance from the capital. In holding the lent (or spring) assizes, the northern circuit extends only to York and Lancaster; the assizes at Durham, Newcastle, Carlisle, and Appleby, being held only in the autumn,

England.

313
Grief and misery of Elizabeth.

314
Her death.

England. autumn, and distinguished by the appellation of the *long circuit*. These circuits and counties are:

1. *Home Circuit* contains the counties of Essex, Hertford, Kent, Surry, and Suffex.

2. *Norfolk Circuit* contains those of Bucks, Bedford, Huntingdon, Cambridge, Suffolk, and Norfolk.

3. *Oxford Circuit*. Oxon, Berks, Gloucester, Worcester, Monmouth, Hereford, Salop, and Stafford.

4. *Midland Circuit*. Warwick, Leicester, Derby, Nottingham, Lincoln, Rutland, and Northampton.

5. *Western Circuit*. Hants, Wilts, Dorset, Somerset, Devon, and Cornwall.

6. *Northern Circuit*. York, Durham, Northumberland, Lancaster, Westmoreland, and Cumberland.

Middlesex and Cheshire are not comprehended in the above circuits; the former being the seat of the supreme courts of justice, and the latter a county palatine. There is still a court of chancery in Lancaster and Durham, with a chancellor; and there is a court of exchequer at Chester, of a mixed kind, both for law and equity, of which the chamberlain of Chester is judge: there are also other justices in the counties palatine to determine civil actions and pleas of the crown.

Besides the 40 counties into which England is divided, there are counties corporate, consisting of certain districts, to which the liberties and jurisdictions peculiar to a county have been granted by charter from the throne. Thus the city of London is a county distinct from Middlesex; the cities of York, Chester, Bristol, Norwich, Worcester, and the towns of Kingston upon Hull and Newcastle upon Tyne, are counties of themselves, distinct from those in which they lie. The same may be said of Berwick upon Tweed, which lies in Scotland, and has within its jurisdiction a small territory of two miles on the north side of the river. Under the name of a *town*, boroughs and cities are contained: for every borough or city is a town, though every town is not a borough or city.—An account of the English constitution and government is given under the articles KING, LORDS, COMMONS, PARLIAMENT, LAW, LIBERTY, RIGHTS, &c.

The established religion of England is Episcopacy. Since the reign of Henry VIII. the sovereigns of England have been called, in public writs, the supreme heads of the church; but this title conveys no spiritual meaning, as it only denotes the regal power to prevent any ecclesiastical differences, or, in other words, to substitute the king in place of the pope before the reformation, with regard to temporalities and the internal economy of the church. The kings of England never intermeddle in ecclesiastical disputes, and are contented to give a sanction to the legal rights of the clergy.

The church of England, under this description of the monarchical power over it, is governed by two archbishops, and 24 bishops, besides the bishop of Sodor and Man, who, not being possessed of an English barony, does not sit in the house of peers. See ARCHBISHOP and BISHOP.

England contains about 60 archdeacons. Subordinate to them are the rural deacons, formerly styled *archpresbyters*, who signify the bishop's pleasure to his clergy, the lower class of which consists of parishes (who are called *rectors* or *vicars*), deacons, and

curates. See the articles CURATE, DEACON, PARSON, England, and VICAR.

The following is a list of the English bishoprics, with their revenues, as charged in the king's books; though that sum is far from being the real annual value of the see, yet it affords in forming a comparative of the estimate between the revenues of each see with those of another.

	ARCHBISHOPS.	£.	s.	d.
Canterbury,	-	2682	12	2
York,	-	1610	0	0
	BISHOPS.			
London,	-	2000	0	0
Durham,	-	1821	1	3
Winchester,	-	3124	12	8
These three bishops take precedence of all others in England, and the others according to the seniority of their consecrations.				
Ely,	-	2134	18	6
Bath and Wells,	-	533	1	3
Hereford,	-	768	11	0
Rochester,	-	358	4	9
Lichfield and Coventry,	-	559	17	3
Chester,	-	420	1	8
Worcester,	-	929	13	3
Chichester,	-	677	1	3
St Asaph,	-	187	11	8
Salisbury,	-	1385	5	0
Bangor,	-	131	16	3
Norwich,	-	834	11	7
Gloucester,	-	315	7	3
Landaff,	-	154	14	2
Lincoln,	-	894	18	1
Bristol,	-	294	11	0
Carlisle,	-	531	4	9
Exeter,	-	500	0	0
Peterborough,	-	414	14	8
Oxford,	-	381	11	0
St Davids,	-	426	2	1

The ecclesiastical government of England is, properly speaking, lodged in the convocation; which is a national representative or synod, and answers pretty near to the ideas we have of a parliament. They are convoked at the same time with every parliament; and their business is to consider of the state of the church, and to call those to an account who have advanced new opinions, inconsistent with the doctrines of the church of England. Some high-flying clergymen during the reign of queen Anne, and in the beginning of that of George I. raised the powers of the convocation to a height that was inconsistent with the principles of religious toleration, and indeed of civil liberty: so that the crown was obliged to exert its prerogative of calling the members together, and of dissolving them; and ever since they have not been permitted to sit for any time, in which they could do business.

NEW ENGLAND, late a province of the British empire in America, is bounded on the north by Canada, on the east by Nova Scotia and the Atlantic ocean, on the south by the Atlantic and Long Island Sound, and on the west by New York. It lies in the form of a quarter of a circle. Its west line, beginning at the mouth of Byram river which empties into Long Island Sound at the south-west corner of Connecticut, latitude 41°, runs a little east of north, until

New
England.

til it strikes the 45th degree of latitude, and then curves to the eastward almost to the gulph of St Lawrence.

¹
When first
discovered.

This country was discovered in the beginning of the last century, and called *North Virginia*; but no Europeans settled there till the year 1608. The first colony, which was weak and ill-directed, did not succeed; and, for some time, there were only a few adventurers who came over at times in the summer, built themselves temporary huts for the sake of trading with the savages, and, like them, disappeared again for the rest of the year. At last some Brownells, headed by Mr Robinson, whom Neal styles the Father of the Independents, who in 1610 had been driven from England by persecution, fled to Holland, and settled at Leyden; but in 1621 determined, with Mr Brewster assistant preacher to Mr Robinson, to found a church for their sect in the new hemisphere. They therefore purchased, in 1521, the charter of the English North Virginia company. Forty-one families, making in all 120 persons, landed in the beginning of a very hard winter, and found a country entirely covered with wood, which offered a very melancholy prospect to men already exhausted with the fatigues of their voyage. Near one half perished either by cold, the scurvy, or other distempers. The courage of the rest was beginning to fail; when it was revived by the arrival of 60 savage warriors, who came to them in the spring, headed by their chief. The old tenants assigned for ever to the new ones all the lands in the neighbourhood of the settlement they had formed, under the name of *New Plymouth*; and one of the savages who understood a little English, staid to teach them how to cultivate the maize, and instruct them in the manner of fishing upon their coast.

This kindness enabled the colony to wait for the companions they expected from Europe with seeds, with domestic animals, and with every assistance they wanted. At first these succours arrived but slowly; but the persecution of the Puritans in England increased the number of proselytes to such a degree in America, that in 1630 they were obliged to form different settlements, of which Boston soon became the principal. These first settlers were not merely ecclesiastics, who had been deprived of their preferments on account of their opinions; nor those sectaries influenced by new opinions, that are so frequent among the common people. There were among them several persons of high rank, who, having embraced Puritanism, had taken the precaution to secure themselves an asylum in these distant regions. They had caused houses to be built, and lands to be cleared, with a view of retiring there, if their endeavours in the cause of civil and religious liberty should prove abortive.

The inhabitants of New England lived peaceably for a long time, without any regular form of policy. Their charter had indeed authorized them to establish any mode of government they might choose; but these enthusiasts were not agreed among themselves upon the plan of their republic and government did not pay sufficient attention to them to urge them to secure their own tranquillity. At length they grew sensible of the necessity of a regular legislation; and this great work, which virtue and genius united have never attempted but with diffidence, was boldly undertaken by

blind fanaticism. It bore the stamp of the rude prejudices on which it had been formed. There was in this new code a singular mixture of good and evil, of wisdom and folly. No man was allowed to have a share in the government except he were a member of the established church. Witchcraft, perjury, blasphemy, and adultery, were made capital offences; and children were also punished with death, either for cursing or striking their parents. Marriages, however, were to be solemnized by the magistrate. The price of corn was fixed at 2s. 11½d. per bushel. The savages who neglected to cultivate their lands were to be deprived of them; and Europeans were forbidden under a heavy penalty to sell them any strong liquors or warlike stores. All those who were detected either in lying, drunkenness, or dancing, were ordered to be publicly whipped. But at the same time that amusements were forbidden equally with vices and crimes, one might be allowed to swear by paying a penalty of 11½d. and to break the sabbath for 2l. 19s. 9½d. Another indulgence allowed was, to atone, by a fine, for a neglect of prayer, or for uttering a rash oath. But it is still more extraordinary, that the worship of images were forbidden to the Puritans on pain of death; which was also inflicted on Roman Catholic priests, who should return to the colony after they had been banished; and on Quakers who should appear again after having been whipped, branded, and expelled. Such was the abhorrence for their sectaries, who had themselves an aversion for every kind of cruelty, that whoever either brought one of them into the country, or harboured him but for one hour, was liable to pay a considerable fine.

Those unfortunate members of the colony, who, less violent than their brethren, ventured to deny the coercive power of the magistrate in matters of religion, were persecuted with still greater rigour. This was considered as blasphemy by those very divines who had rather chosen to quit their country than to show any deference to Episcopal authority. This system was supported by the severities of the law, which attempted to put a stop to every difference in opinion, by inflicting capital punishment on all who dissented. Those who were either convicted, or even suspected, of entertaining sentiments of toleration, were exposed to such cruel oppressions, that they were forced to fly from their first asylum, and seek refuge in another. They found one on the same continent; and as New England had been first founded by persecution, its limits were extended by it.

This intemperate religious zeal extended itself to matters in themselves of the greatest indifference. A proof of this is found in the following public declaration, transcribed from the registers of the colony.

"It is a circumstance universally acknowledged, that the custom of wearing long hair, after the manner of immoral persons and of the savage Indians, can have been introduced into England only in sacrilegious contempt of the express command of God, who declares that it is a shameful practice for any man who has the least care for his soul to wear long hair. As this abomination excites the indignation of all pious persons; we, the magistrates, in our zeal for the purity of the faith, do expressly and authentically declare, that we condemn the im-
 "pious."

New
England.

²
First code
of laws.

Quakers
persecuted.

⁴
Laws against
wearing
long hair.

Reynold's
History of
European
Settlements.

New
England.

" pious custom of letting the hair grow ; a custom which we look upon to be very indecent and dishonest, which horribly disgraces men, and is offensive to modest and sober persons, in as much as it corrupts good manners. We therefore, being justly incensed against this scandalous custom, do desire, advise, and earnestly request all the elders of our continent, zealously to show their aversion for this odious practice, to exert all their power to put a stop to it, and especially to take care that the members of their churches be not infected with it ; in order that those persons who, notwithstanding these rigorous prohibitions, and the means of correction that shall be used on this account, shall still persist in this custom, shall have both God and man at the same time against them."

This severity soon exerted itself against the Quakers. They were whipped, banished, and imprisoned. The behaviour of these new enthusiasts, who in the midst of tortures and ignominy praised God, and called for blessings upon men, inspired a reverence for their persons and opinions, and gained them a number of proselytes. This circumstance exasperated their persecutors, and hurried them on to the most atrocious acts of violence ; and they caused five of them, who had returned clandestinely from banishment, to be hanged. This spirit of persecution was, however, at last suppressed by the interposition of the mother-country, from whence it had been brought. Charles II. moved with the sufferings of the Quakers, put a stop to them by a proclamation in 1661 ; but he was never able totally to extinguish the spirit of persecution that prevailed in America.

The colony had placed at their head Henry Vane, the son of that Sir Henry Vane who had such a remarkable share in the disturbances of his country. This obstinate and enthusiastic young man had contrived to revive the questions of grace and free-will. The disputes upon these points ran very high ; and would probably have plunged the colony into a civil war, if several of the savage nations united had not happened at that very time to fall upon the plantations of the disputants, and to massacre great numbers of them. The colonists, heated with their theological contests, paid at first very little attention to this considerable loss. But the danger at length became so urgent and so general, that all took up arms. As soon as the enemy was repulsed, the colony resumed its former dissensions ; and the phrenzy which they excited broke out in 1692 in a war, marked with as many atrocious instances of violence as any ever recorded in history.

5
Extraordi-
nary per-
secution of
witches.

There lived in a town of New England, called *Salem*, two young women who were subject to convulsions, accompanied with extraordinary symptoms. Their father, minister of the church, thought that they were bewitched ; and having in consequence cast his suspicions upon an Indian girl who lived in his house, he compelled her by harsh treatment to confess that she was a witch. Other women, upon hearing this, immediately believed, that the convulsions, which proceeded only from the nature of their sex, were owing to the same cause. Three citizens, casually named, were immediately thrown into prison, accused of witchcraft, hanged, and their bodies left exposed to wild

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England.

beasts and birds of prey. A few days after, 16 other persons, together with a counsellor, who, because he refused to plead against them, was supposed to share in their guilt, suffered in the same manner. From this instant, the imagination of the multitude was inflamed with these horrid and gloomy scenes. Children of ten years of age were put to death, young girls were stripped naked, and the marks of witchcraft searched for upon their bodies with the most indecent curiosity ; and those spots of the scurvy which age impresses upon the bodies of old men, were taken for evident signs of the infernal power. In default of these, torments were employed to extort confessions dictated by the executioners themselves. If the magistrates, tired out with executions, refused to punish, they were themselves accused of the crimes they tolerated ; the very ministers of religion raised false witnesses against them, who made them forfeit with their lives the tardy remorse excited in them by humanity. Dreams, apparitions, terror, and confirmation of every kind, increased these prodigies of folly and horror. The prisons were filled, the gibbets left standing, and all the citizens involved in gloomy apprehensions. The most prudent quitted the country stained with the blood of its inhabitants ; and nothing less than the total and immediate subversion of the colony was expected, when, on a sudden, all eyes were opened at once, and the excesses of the evil awakened the minds which it had first stupified. Bitter and painful remorse was the immediate consequence ; the mercy of God was implored by a general fast, and public prayers were offered up to ask forgiveness for the presumption of having supposed that heaven could have been pleased with sacrifices with which it could only have been offended.

Posterity will, probably, never know exactly what was the cause or remedy of this dreadful disorder. It had, perhaps, its first origin in the melancholy which those persecuted enthusiasts had brought with them from their own country, which had increased with the scurvy they had contracted at sea, and had gathered fresh strength from the inconveniences and hardships inseparable from a change of climate and manner of living. The contagion, however, ceased like all other epidemical distempers, exhausted by its very communication. A perfect calm succeeded this agitation ; and the Puritans of New England have never since been seized with so gloomy a fit of enthusiasm.

But though the colony has renounced the persecuting spirit which hath stained all religious sects with blood, it has preserved some remains, if not of intolerance, at least of severity, which remind us of those melancholy days in which it took its rise. Some of its laws are still too severe.

New England had, however, some remedy against bad laws, in the constitution of its mother-country, where the people who have the legislative power in their own hands are at liberty to correct abuses ; and it has others derived from its situation, which open a vast field to industry and population.

The clearing of the lands in this colony is not deterred by chance as in the other provinces. This matter from the first was subjected to laws which are still religiously observed. No citizen whatever has the liberty of settling even upon unoccupied land. The government, desirous of preserving all its members from

6
Manner of
settlement
in this co-
lony.

New
England.New
England.

the inroads of the savages, and of placing them in a condition to share in the protection of a well-regulated society, hath ordered that whole villages should be formed at once. As soon as 60 families offer to build a church, maintain a clergyman, and pay a school-master, the general assembly allot them a situation, and permit them to have two representatives in the legislative body of the colony. The district assigned them always borders upon the lands already cleared, and generally contains 60,000 square acres. These new people choose the situation most convenient for their habitation, which is usually of a square figure. The church is placed in the centre; the colonists divide the land among themselves, and each incloses his property with a hedge. Some woods are reserved for a common; and thus New England is constantly enlarging its territory, though it still continues to make one complete and well constituted province.

The country was divided into four states, which at first had no connection with one another. The necessity of maintaining an armed force against the savages, obliged them to form a confederacy in 1643, when they took the name of the *United Colonies*. In consequence of this league, two deputies from each establishment used to meet in a stated place to deliberate upon the common affairs of New England, according to the instructions they had received from the assembly by which they were sent. This association laid no constraint upon the right of every individual to act entirely as he pleased, without either the permission or approbation of the mother-country. All the submission required of these provinces was merely to acknowledge the kings of England for their sovereigns. Charles II. wished to make them more dependent. The province of Massachusetts bay, which, though the smallest, was the richest and the most populous of the four, being guilty of some misdemeanour against government, the king seized that opportunity of taking away its charter in 1684; and it remained without one till the revolution; when it received another, which, however, did not answer its claims or expectations. The crown referred to itself the right of nominating the governor, and appointing to all military employments, and to all principal posts in the civil and juridical departments: it allowed the people of the colony their legislative power, and gave the governor a negative voice and the command of the troops, which secured him a sufficient influence to enable him to maintain the prerogative of the mother-country in all its force. The provinces of Connecticut and Rhode-Island, by timely submission, prevented the punishment which that of Massachusetts had incurred, and retained their original charter. That of New-Hampshire had been always regulated by the same mode of administration as the province of Massachusetts bay. The same governor presided over the whole colony, but with regulations adapted to the constitution of each province. To the above states, another has been added since the late revolution, *viz.* VERMONT. These states are subdivided into counties, and the counties into townships.

New England is a high, hilly, and in some parts a mountainous country, formed by nature to be inhabited by a hardy race of free, independent republicans. — The mountains are comparatively small, running nearly north and south in ridges parallel to each other.

Between these ridges flow the great rivers in majestic meanders, receiving the innumerable rivulets and larger streams which proceed from the mountains on each side. To a spectator on the top of a neighbouring mountain, the vales between the ridges, while in a state of nature, exhibit a romantic appearance. They seem an ocean of woods, swelled and depressed in its surface like that of the great ocean itself. A richer though less romantic view is presented, when the valleys, by industrious husbandmen, have been cleared of their natural growth; and the fruit of their labour appears in loaded orchards, extensive meadows, covered with large herds of sheep and neat cattle, and rich fields of flax, corn, and the various kinds of grain. These valleys, which have received the expressive name of *interval lands*, are of various breadths, from 2 to 20 miles; and by the annual inundations of the rivers which flow through them, there is frequently an accumulation of rich, fat soil, left upon their surface when the waters retire.

There are four principal ranges of mountains, passing nearly from north-east to south-west through New-England. These consist of a multitude of parallel ridges, each having many spurs, deviating from the course of the general range; which spurs are again broken into irregular hilly land. The main ridges terminate, sometimes in high bluff heads, near the sea-coast, and sometimes by a gradual descent in the interior part of the country. One of the main ranges runs between Connecticut and Hudson's rivers. This range branches and bounds the vales through which flows the Housatonic river. The most eastern ridge of this range terminates in a bluff head at Meriden; a second ends in like manner at Willingford, and a third at New Haven. In Lyme, on the east side of Connecticut river, another range of mountains commences, forming the eastern boundary of Connecticut vale. This range trends northerly, at the distance, generally, of about 10 or 12 miles east from the river, and passes through Massachusetts, where the range takes the name of *Chickaboe Mountain*; thence crossing into New Hampshire, at the distance of about 20 miles from the Massachusetts line, it runs up into a very high peak, called *Monadnick*, which terminates this ridge of the range. A western ridge continues, and in about latitude $43^{\circ} 20'$ runs up into Sunapee mountains. About 50 miles further, in the same ridge, is Mooscoog mountain. A third range begins near Stonington in Connecticut. It takes its course north-easterly, and is sometimes broken and discontinued; it then rises again, and ranges in the same direction into New Hampshire, where, in latitude $43^{\circ} 25'$, it runs up into a high peak called *Cowasawlog*. The fourth range has a humble beginning about Hopkinton in Massachusetts. The eastern ridge of this range runs north by Watertown and Concord, and crosses Merrimack river at Pantucket Falls. In New Hampshire, it rises into several high peaks, of which the White mountains is the principal. From these White mountains a range continues north east, crossing the east boundary of New Hampshire, in latitude $44^{\circ} 30'$, and forms the height of land between Kennebec and Chaudiere rivers. These ranges of mountains are full of lakes, ponds, and springs of water, that give rise to numberless streams of various sizes, which, interlocking

7
Division,
&c.8
Face of the
country,
mountains,
&c.

New
England.

ing each other in every direction, and falling over the rocks in romantic cascades, flow meandering into the rivers below. No country on the globe is better watered than New England.

On the sea-coast the land is low, and in many parts level and sandy. In the valleys, between the forementioned ranges of mountains, the land is generally broken, and in many places rocky, but of a strong rich soil, capable of being cultivated to good advantage, which also is the case with many spots even on the tops of the mountains.

The principal river in New England is Connecticut. See CONNECTICUT.

9
Soil, pro-
ductions,
&c.

The soil, as may be collected from what has been said, must be very various. Each tract of different soil is distinguished by its peculiar vegetation, and is pronounced good, middling, or bad, from the species of trees which it produces; and from one species generally predominating in each soil, has originated the descriptive names of oak land, birch, beech, and chefnut lands, pine, barren, maple, ash, and cedar swamps, as each species happens to predominate. Intermingled with those predominating species are walnut, firs, elm, hemlock, magnolia, moose wood, sassafras, &c. &c. The best lands produce walnut and chefnut; the next, beech and oak; lands of the third quality produce fir and pitch pine; the next, whortleberry and barberry bushes; and the poorest produce nothing but marshy imperfect shrubs. Among the flowering trees and shrubs in the forests, are the red-flowering maple, the sassafras, the locust-tree, the tulip-tree, honeysuckle, wild rose, dogwood, elm, leather-tree, laurel, hawthorn, &c. which in the spring of the year give the woods a most beautiful appearance, and fill them with a delicious fragrance. Among the fruits which grow wild, are the several kinds of grapes; which are small, sour, and thick skinned. The vines on which they grow are very luxuriant, often overspreading the highest trees in the forests; and without doubt, might be greatly meliorated by proper cultivation. Besides these, are the wild cherries, white and red mulberries, cranberries, walnuts, hazelnuts, chefnuts, butter nuts, beech nuts, wild plums and pears, whortle-berries, bilberries, gooseberries, strawberries, &c.

The soil in the interior country is calculated for the culture of Indian corn, rye, oats, barely, flax, and hemp (for which the soil and climate are peculiarly proper), buck-wheat, beans, peas, &c. In many of the inland parts wheat is raised in large quantities; but on the sea-coast it has never been cultivated with success, being subject to blasts. The fruits which the country yields from culture, are, apples in the greatest plenty; of these cyder is made, which constitutes the principal drink of the inhabitants; also, pears of various sorts, quinces, peaches (from which is made peach brandy,) plums, cherries, apricots, &c. The culinary plants are such as have already been enumerated. New England is a fine grazing country; the valleys between the hills are generally intersected with brooks of water, the banks of which are lined with a tract of rich meadow or interval land. The high and rocky ground is, in many parts, covered with honeysuckle, and generally affords the finest of pasture. It will not be a matter of wonder, therefore, that New England boasts of raising some of the finest cattle in the world; nor will

New
England.

she be envied, when the labour of raising them is taken into view. Two months of the hottest season in the year the farmers are employed in procuring food for their cattle; and the cold winter is spent in dealing it out to them. The pleasure and profit of doing this, is however a satisfying compensation to the honest and industrious farmer.

New England is the most populous part of the United States. It contains at least 823,000 souls. One fifth of these are fencible men. New England then, should any great and sudden emergency require it, could furnish an army of 164,600 men. The great body of these are land-holders and cultivators of the soil. The former attaches them to their country; the latter, by making them strong and healthy, enables them to defend it. The boys are early taught the use of arms, and make the best of soldiers. Few countries on earth, of equal extent and population, can furnish a more formidable army than this part of the union.

New England may, with propriety, be called a nursery of men, whence are annually transplanted, into other parts of the United States, thousands of its natives. The State of Vermont, which is but of yesterday, and contains about 100,000 souls, has received more inhabitants from Connecticut than from any other state; and yet between the years 1774 and 1782, notwithstanding her numerous emigrations to Vermont, Susquehannah, and other places, and the depopulation occasioned by a seven years bloody war, it is found, from an actual census of the inhabitants in the years before-mentioned, that they have increased from 197,856, their number in 1774, to 290,150, their number in 1782. Vast numbers of the New Englanders, since the war, have emigrated into the northern parts of New York, into Kentucky and the Western Territory, and into Georgia; and some are scattered into every State, and every town of note in the union.

The New Englanders are generally tall, stout, and well built. They glory, and perhaps with justice, in possessing that spirit of freedom which induced their ancestors to leave their native country, and to brave the dangers of the ocean and the hardships of settling a wilderness. Their education, laws, and situation, serve to inspire them with high notions of liberty. Their jealousy is awakened at the first notion toward an invasion of their rights. They are indeed often jealous to excess; a circumstance which is a fruitful source of imaginary grievances, and of innumerable groundless suspicions and unjust complaints against government. A law, respecting the descent of estates which are generally held in fee simple, which for substance is the same in all the New England states, is the chief foundation and protection of this liberty. By this law, the possessions of the father are to be equally divided among all the children, excepting the eldest son, who has a double portion. In this way is preserved that happy mediocrity among the people, which, by inducing economy and industry, removes from them temptations to luxury, and forms them to habits of sobriety and temperance. At the same time, their industry and frugality exempt them from want, and from the necessity of submitting to any encroachment on their liberties.

In New England, learning is more generally diffused among all ranks of people than in almost any other

to
Popular
U-manners,
customs,
and disci-
pline.

New
England.

other part of the globe; arising from the excellent establishment of schools in every township. Another source of information to the people is the newspapers, of which not less than 30,000 are printed every week in New England, and circulated in almost every town and village in the country. A person of mature age, who cannot both read and write, is rarely to be found. By means of this general establishment of schools, the extensive circulation of newspapers, and the consequent spread of learning, every township throughout the country is furnished with men capable of conducting the affairs of their town with judgment and discretion. These men are the channels of political information to the lower class of people; if such a class may be said to exist in New England, where every man thinks himself at least as good as his neighbour, and believes that all mankind are, or ought to be, equal. The people from their childhood form habits of canvassing public affairs, and commence politicians. This naturally leads them to be very inquisitive. This desire after knowledge, in a greater or less degree, prevails throughout all classes of people in New England: and from their various modes of expressing it, some of which are blunt and familiar, bordering on impertinence, strangers have been induced to mention impertinent inquisitiveness as a distinguishing characteristic of New England people.—Each man also has his independent system of politics; and each assumes a dictatorial office. Hence originates that restless, litigious, complaining spirit, which forms a dark shade in the character of New Englandmen.

Before the late war, which introduced into New England a flood of corruptions, with many improvements, the Sabbath was observed with great strictness; no unnecessary travelling, no secular business, no visiting, no diversions were permitted on that sacred day. They considered it as consecrated to divine worship, and were generally punctual and serious in their attendance upon it. Their laws were strict in guarding the Sabbath against every innovation. The supposed severity with which these laws were composed and executed, together with some other traits in their religious character, have acquired, for the New Englanders, the name of a superstitious bigotted people. But superstition and bigotry are so indefinite in their significations, and so variously applied by persons of different principles and educations, that it is not easy to determine how far they deserved that character. Leaving every person to enjoy his own opinion in regard to this matter, we will only observe, that, since the war, a catholic tolerant spirit, occasioned by a more enlarged intercourse with mankind, has greatly increased, and is becoming universal; and if they do not break the proper bound, and liberalize away all true religion, of which there is much danger, they will counteract that strong propensity in human nature, which leads men to vibrate from one extreme to its opposite.

There is one distinguishing characteristic in the religious character of this people, which we must not omit to mention; and that is, the custom of annually celebrating fasts and thanksgivings. In the spring, the federal governors issue their proclamations, appointing a day to be religiously observed in fasting, humiliation, and prayer, throughout their respective states, in which the predominating vices, that particularly call for hu-

miliation, are enumerated. In autumn, after harvest, that gladsome era in the husbandman's life, the governors again issue their proclamations appointing a day of public thanksgiving, enumerating the public blessings received in the course of the foregoing year. This pious custom originated with their venerable ancestors, the first settlers of New England; and has been handed down as sacred through the successive generations of their posterity. A custom so rational, and so happily calculated to cherish in the minds of the people a sense of their dependence on the great Benefactor of the world for all their blessings, it is hoped will ever be sacredly preserved.

The people of New England generally obtain their estates by hard and persevering labour: They of consequence know their value, and spend with frugality. Yet in no country do the indigent and unfortunate fare better. Their laws oblige every town to provide a competent maintenance for their poor; and the necessitous stranger is protected and relieved from their humane institutions. It may in truth be said, that in no part of the world are the people happier, better furnished with the necessaries and conveniences of life, or more independent than the farmers in New England. As the great body of the people are hardy independent freeholders, their manners are, as they ought to be, congenial to their employment, plain, simple, and unpolished. Strangers are received and entertained among them with a great deal of artless sincerity and friendly informal hospitality. Their children, those imitative creatures, to whose education particular attention is paid, early imbibe the manners and habits of those around them; and the stranger, with pleasure, notices the honest and decent respect that is paid him by the children as he passes through the country.

As the people, by representation, make their own laws and appoint their own officers, they cannot be oppressed; and living under governments which have few lucrative places, they have few motives to bribery, corrupt canvassings, or intrigue. Real abilities and a moral character unblemished are the qualifications requisite in the view of most people for offices of public trust. The expression of a wish to be promoted is the direct way to be disappointed.

The inhabitants of New England are generally fond of the arts, and have cultivated them with great success. Their colleges have flourished beyond any others in the United States. The illustrious characters they have produced, who have distinguished themselves in politics, law, divinity, the mathematics and philosophy, natural and civil history, and in the fine arts, particularly in poetry, evince the truth of these observations.

Many of the women in New England are handsome. They generally have fair, fresh, and healthful countenances, mingled with much female softness and delicacy. Those who have had the advantages of a good education (and they are considerably numerous), are genteel, easy, and agreeable in their manners, and are sprightly and sensible in conversation. They are early taught to manage domestic concerns with neatness and economy. Ladies of the first rank and fortune make it a part of their daily business to superintend the affairs of the family. Employment at the needle, in cookery, and at the spinning-wheel, with them is honourable. Idleness, even in those of independent for-

New
England.

New
England,
English.

tunes, is universally disreputable. The women in the country manufacture the greatest part of the clothing of their families. Their linen and woollen cloths are strong and decent. Their butter and cheese is not inferior to any in the world.

Dancing is the principal and favourite amusement in New England; and of this the young people of both sexes are extremely fond. Gaming is practised by none but those who cannot or rather will not find a reputable employment. The gameller, the horse-jockey, and the knave, are equally despised, and their company is avoided by all who would sustain fair and irreproachable characters. The odious and inhuman practices of duelling, gouging, cock-fighting, and horse-racing, are scarcely known here.—The athletic and healthy diversions of cricket, football, quoits, wrestling, jumping, foot-races, &c. are universally practised in the country, and some of them in the most populous places, and by people of almost all ranks. Squirrel-hunting is a noted diversion in country places, where this kind of game is plenty. Some divert themselves with fox-hunting, and others with the more profitable sports of fishing and duck-hunting; and in the frontier settlements where deer and fur game abound, the inhabitants make a lucrative sport of hunting them. In the winter season, while the ground is covered with snow, which is commonly two or three months, sleighing is the general diversion. A great part of the families throughout the country are furnished with horses and sleighs.

Trade.

New England has no one staple commodity. The ocean and the forests afford the two principal articles of export. Codfish, mackerel, shad, salmon, and other fish—whale oil and whale bone—masts, boards, scantling, staves, hoops, and shingles, have been and are still exported in large quantities. The annual amount of cod and other fish for foreign exportation, including the profits arising from the whale-fishery, is estimated at upwards of half a million.—Besides the articles enumerated, they export from the various parts of New England ships built for sale, horses, mules, live stock—pickled beef and pork, potash, pearl-ash, flax, feed, butter and cheese, rum, &c. The balance of trade, as far as imperfect calculations will enable us to judge, has generally been against New England; not from any unavoidable necessity, but from her extravagant importations. From a view of the annual imports into New England, it appears that the greatest part of them consists of the luxuries, or at best the dispensable conveniences of life; the country affords the necessaries in great abundance.

ENGLISH, or the *English Tongue*, the language spoken by the people of England, and, with some variation, by those of Scotland, as well as part of Ireland, and the rest of the British dominions.

The ancient language of Britain is generally allowed to have been the same with the Gallic, or French; this island, in all probability, having been first peopled from Gallia, as both Cæsar and Tacitus affirm, and prove by many strong and conclusive arguments, as by their religion, manners, customs, and the nearness of their situation. But now we have very small remains of the ancient British tongue, except in Wales, Cornwall, the islands and Highlands of Scotland, part of

Ireland, and some provinces of France; which will not appear strange, when what follows is considered.

Julius Cæsar, some time before the birth of our Saviour, made a descent upon Britain, though he may be said rather to have discovered than conquered it; but about the year of Christ 45, in the time of Claudius, Aulus Plautius was sent over with some Roman forces, by whom two kings of the Britons, Togodumnus and Caratacus, were both overcome in battle: whereupon a Roman colony was planted at Malden in Essex, and the northern parts of the island were reduced to the form of a Roman province: after that, the island was conquered as far north as the friths of Dunbarton and Edinburgh, by Agricola, in the time of Domitian; whereupon a great number of the Britons, in the conquered part of the island, retired to the west part called *Wales*, carrying their language with them.

The greatest part of Britain being thus become a Roman province, the Roman legions, who resided in Britain for above 200 years, undoubtedly disseminated the Latin tongue; and the people being afterwards governed by laws written in Latin, must necessarily make a mixture of languages. This seems to have been the first mutation the language of Britain suffered.

Thus the British tongue continued, for some time, mixed with the provincial Latin, till, the Roman legions being called home, the Scots and Picts took the opportunity to attack and harass England: upon which, K. Vortigern, about the year 449, called the Saxons to his assistance; who came over with several of their neighbours, and having repulsed the Scots and Picts, were rewarded for their services with the Isle of Thanet and the whole county of Kent; but growing too powerful, and not being contented with their allotment, dispossessed the inhabitants of all the country on this side of the Severn*: thus the British tongue was in a great measure destroyed, and the Saxon introduced in its stead.

What the Saxon tongue was long before the conquest, about the year 700, we may observe in the most ancient manuscript of that language, which is a gloss on the Evangelists, by bishop Edfrid, in which the three first articles of the Lord's prayer run thus:

"Uren fader thic arth in heofnas, ðe gehalgod thū noma, so cymeth thū ric. Sic thū willa sue is hefnas, and in eorðlo," &c.

In the beginning of the ninth century the Danes invaded England; and getting a footing in the northern and eastern parts of the country, their power gradually increased, and they became sole masters of it in about 200 years. By this means the ancient British obtained a tincture of the Danish language; but their government being of no long continuance, did not make so great an alteration in the Anglo-Saxon as the next revolution, when the whole land, A. D. 1067, was subdued by William the conqueror, Duke of Normandy in France: for the Normans, as a monument of their conquest, endeavoured to make their language as generally received as their commands, and thereby rendered the British language an entire medley.

About the year 900, the Lord's prayer, in the ancient Anglo-Saxon, ran thus:

"Thūc ur fader the eart on heofenum, si thū nama gehalgod;

* See *Engl. Ind.* n^o 13, — 42.

English.

gehalgod; cume thin rice fi thin willa on corthan swa, two on hocfom," &c.

About the year 1160, under Henry II. it was rendered thus by Pope Adrian, an Englishman, in rhyme :

" Use fader in heaven rich,
" Thy name be halyed ever lich,
" Thow bring us thy michel blisse:
" A's hit in heaven y doe,
" Evar in yearth been it also," &c.

Dr Hicks gives us an extraordinary specimen of the English, as spoken in the year 1385, upon the very subject of the English tongue.

" As it is knowe how meny maner peple beeth in this lond; ther beeth also fo many dyvers longages and tonges. Nothelefs Walschemen and Scots that beeth nought medled with other nation, holdeh wel nyh hir firste longage and speche; but yif the Scottes, that were sometime confederate and woned with the Pictes, drawe somewhat after hir speche; but the FLEMINGES, that woneth on the west side of Wales, haveth lost hir strange spech, and spekehth Saxonlike now. Also Englishmen, they had from the bygynnyng thre maner speche; northerne, southerne, and middel speche in the middel of the lond, as they come of thre maner of peple of Germania: nothelefs by comynxion and melynge first with Danes, and afterwards with Normans, in meny the contrary longage is apayred (*corrupted*.)

" This apayrynge of the burth of the tunge is by cause of twie things; oon is for children in scole agens the usfage and maner of all other nations, beeth compelled for to leve hir own longage, and for to construe hir lessions and here things in Frensche, and so they haveth sethe Normans come first into Engeland. Also gentlemen children beeth taught to speke Frensche from the tyme that they beeth roked in here cradel, and kunneth speke and play with a childe's broche; and uplondische men will lyke hymself to gentilmen, and fondeth with great belynesse for to speake Frensche to be told of.—Hit seemeth a greet wonder how Englishmen and hir own longage and tonge is so dyverie of fown in this oon iland: and the longage of Normandie is comlyng of another lond, and hath oon maner foun amonge alle men that spekehth hit arigt in Engeland. Also of the foresaid Saxon tonge that is ded (*divided*) a thre, and is abide fearceliche with fewe uplondische men, is greet wonder. For men of the cit, with men of the weis, as it was, under the same partie of hevenc accordeth more in fownyng of speche, than men of the north with men of the south. Therefore it is that Mercii, that beeth men of myddel Engeland, as it were, partners of the endes, underfondeth better the side longes northerne and southerne, than northerne and southerne underfondeth either other.—All the longage of the Northumbers and spechliche at York, is so scharp, flitting and frotyng, and unshape, that we southerne men may that longage unnethe underfonde," &c.

In the year 1537, the Lord's prayer was printed as follows: "O our father which arte in heaven, hallowed be thy name: let thy kyngdome come, thy will be fulfilled as well in erth as it is in heaven; geve us this daye in dayly bred," &c. Where it may be observed, that the diction is brought almost to the present standard, the chief variations being only in the orthography.

By these instances, and many others that might be given, it appears, that the English Saxon language, of which the Normans despoiled us in a great measure, had its beauties, was significant and emphatical, and preferable to what they imposed on us. "Great, verily (says Camden), was the glory of our tongue before the Norman conquest, in this, that the old English could expresse most aptly, all the conceptions of the mind in their own tongue, without borrowing from any." Of this he gives several examples.

Having thus shown how the ancient British language was in a manner extirpated by the Romans, Danes, and Saxons, and succeeded by the Saxon, and after that the Saxon blended with the Norman French, we shall now mention two other causes of change in the language. The first of these is owing to the Britons having been a long time a trading nation, whereby offices, dignities, names of wares, and terms of traffic, are introduced, which we take with the wares from the persons of whom we have them, and form them anew, according to the genius of our own tongue; and besides this change in the language, arising from commerce, Britain's having been a considerable time subject to the fee of Rome, in ecclesiastical affairs, must unavoidably have introduced some Italian words among us. Secondly, As to the particular properties of a language, our tongue has undergone no small mutation, or rather has received no small improvement upon that account: for, as to the Greek and Latin, the learned have, together with the arts and sciences now rendered familiar among us, introduced abundance; nay, almost all the terms of art in the mathematics, philosophy, physic, and anatomy; and we have entertained many more from the Latin, French, &c. for the sake of neatness and elegance; so that, at this day, our language, which, about 1800 years ago, was the ancient British, or Welsh, &c. is now a mixture of Saxon, Teutonic, Dutch, Danish, Norman, and modern French, embellished with the Greek and Latin. Yet this, in the opinion of some, is so far from being a disadvantage to the English tongue as now spoken (for all languages have undergone changes, and do continually participate with each other), that it has so enriched it, as now to render it the most copious, significant, fluent, courteous, and masculine language in Europe, if not in the world.

ENGRAFTING, in gardening. See GRAFTING.

ENGRAILED, or INGRAILED, in heraldry, a term derived from the French *grésly*, "hail;" and signifying a thing the hail has fallen upon and broke off the edges, leaving them ragged, or with half-rounds, or semicircles, struck out of their edges.

ENGRAVING, the art of cutting metals and precious stones, and representing thereon figures, letters, or whatever device or design the artist fancies.

Engraving, properly a branch of sculpture, is divided into several other branches, according to the matter whereon it is employed, and the manner of performing it. For the rudest branch, that of

ENGRAVING on Wood. See CUTTING in Wood.

ENGRAVING on Copper, the making, correspondently to some delineated figure or design, such concave lines on a smooth surface of copper, either by cutting or corrosion, as render it capable, when charged properly with any coloured fluid, of imparting by compression

English

Engraving.

Engraving. an exact representation of the figure or design to paper or parchment.

Whether we consider the art of engraving, with regard to the utility and pleasure it affords, or the difficulty that attends its execution, we cannot but confess, that on every account it deserves a distinguished rank among the polite arts.† It is by means of this art that the cabinets of the curious are adorned with the portraits of the greatest men of all ages and all nations; that their memories, their most remarkable and most glorious actions, are transmitted to the latest posterity. It is by this art also, that the paintings of the greatest masters are multiplied to a boundless number; and that the lovers of the polite arts, diffused over the face of the whole earth, are enabled to enjoy those beauties from which their distant situations seemed to have for ever debarred them; and persons of moderate fortune are hereby enabled to become possessed of all the spirit, and all the poetry, that are contained in those miracles of art, which seemed to have been reserved for the temples of Italy, or the cabinets of princes. When we reflect, moreover, that the engraver, beside the beauties of poetic composition, and the artful ordinance of design, is to express, merely by the means of light and shade, all the various tints of colours and clear obscure; to give a relief to each figure, and a truth to each object; that he is now to paint a sky serene and bright, and then loaded with dark clouds; now the pure tranquil stream, and then the foaming, raging sea; that here he is to express the character of the man, strongly marked in his countenance, and there the minutest ornament of his dress; in a word, that he is to represent all even the most difficult objects in nature; we cannot sufficiently admire the vast improvements in this art, and that degree of perfection to which it is at this day arrived. See the article PRINTS.

Engraving is an art, for the greatest part, of modern invention; having its rise no earlier than the middle of the 15th century. The ancients, it is true, practised engraving on precious stones and crystals with very good success; and there are still many of their works remaining equal to any production of the later ages. But the art of engraving on plates and blocks of wood, to afford prints or impressions, was not known till after the invention of painting in oil.

The different modes of engraving are the following:

In strokes cut through a thin wax, laid upon the copper, with a point, and these strokes bitten or corroded into the copper with aquafortis. This is called *etching*.

In strokes with the graver alone, unassisted by aquafortis. In this instance, the design is traced with a sharp tool, called a *dry point*, upon the plate; and the strokes are cut or ploughed upon the copper with an instrument distinguished by the name of a *graver*.

In strokes first etched and afterwards finished with the graver: by this expedient the two former methods are united.

In dots without strokes, which are executed with the point upon the wax or ground, bitten in with the aquafortis, and afterwards harmonized with the graver, by the means of which instrument small dots are made; or with the graver alone, as in the flesh and finer parts, unassisted with the point.

In dots first etched and afterwards harmonized with

the dry point, performed by a little hammer called *Engraving opus mallei*, or the work of the hammer, as practised by Lutma and others.

In mezzotinto, which is performed by a dark barb or ground being raised uniformly upon the plate with a toothed tool. The design being traced upon the plate, the light parts are scraped off by instruments for that purpose, in proportion as the effect requires.

In aquatinta, a newly invented method of engraving. The outline is first etched, and afterwards a sort of wash is laid by the aquafortis upon the plate, resembling drawings in Indian ink, bilster, &c.

On wood, performed with a single block, on which the design is traced with a pen, and those parts which should be white carefully hollowed out; and this block is afterwards printed by the letter-press printers, in the same manner as they print a book.

On wood, performed with two, three, or more blocks; the first having the outlines cut upon it; the second is reserved for the darker shadows; and the third for the shadows which terminate upon the lights; and these are substituted in their turn, each print receiving an impression from every block. This mode of engraving is called *chiaro-scuro*, and was designed to represent the drawings of the old masters.

On wood and on copper: in these the outline is engraved in a bold dark style upon the copper; and two or more blocks of wood are substituted to produce the darker and lighter shadows, as before.

Of all these modes of engraving, the most ancient is that on wood; or, to speak more properly, the first impressions on paper were taken from carved wooden blocks. For this invention it appears that we are indebted to the brief-malers or makers of playing-cards, who practised the art in Germany about the beginning of the 15th century. From the same source may perhaps be traced the first idea of moveable types, which appeared not many years after; for these brief-malers did not entirely confine themselves to the printing and painting of cards, but produced also subjects of a more devout nature; many of which, taken from holy writ, are still preserved in different libraries in Germany, with the explanatory text facing the figures; the whole engraved in wood. In this manner they even formed a species of books; such as, *Historia sancti Johannis, quique Visiones Apocalypticæ; Historia Veteris & Novi Testamenti*, known by the name of the *Poor Man's Bible*. These short mementos were printed only on one side; and two of them being pasted together, had the appearance of a single leaf. The earliest date on any of these wooden cuts is 1423. The subject is *St Christopher carrying the Infant Jesus over the Sea*, preserved in a convent at Buxheim near Menningen. It is of a folio size, illuminated in the same manner as the playing cards; and at the bottom is this inscription, *Christopheri faciem die quacunque tueris. Illa nempe die morte mala non morieris. Millefimo CCCC^o XX^o tertio*.

Upon the invention of moveable types, that branch of the brief-malers business, so far as it regarded the making of books, was gradually discontinued; but the art itself of engraving on wood continued in an improving state; and towards the end of the 15th and beginning of the 16th century, it became customary for almost every one of the German engravers on copper

† See Po-
lite ARTS,
n^o 13.

Strutt's
Hist. of En-
graving.

Engraving. copper to engrave on wood also. The works of Albert Durer in this style of engraving are justly held in the highest esteem. Italy, France, and Holland, have produced many capital artists of this kind; but for boldness and spirit, we must see the prints of Christopher Jegher, who worked under the direction of Rubens, and was without doubt assisted by that great master.

The invention of that species of engraving distinguished by the appellation of *chiaro-scuro*, seems also to be justly claimed by the Germans, and first practised by Mair; one of whose prints of this kind is dated 1499. Many excellent works in *chiaro-scuro* have been produced in France; and in Italy it was honoured with the performances of Titian and Parmegiano; but the attempts of Jackson, Kirkall, and others in England, have not been equally successful. A set of excellent prints in this way have lately been published by J. Skippie, Elg; a connoisseur and dilettante.

In Germany, about the year 1450, prints from engraved copper first made their appearance. The earliest date of a copperplate print is indeed only 1461; but however faulty this print may be with respect to the drawing, or defective in point of taste, the mechanical part of the execution of it has by no means the appearance of being one of the first productions of the graver. We have also several other engravings, evidently the work of the same master; in which the impressions are so neatly taken from the plates, and the engravings so clearly printed in every part, that, according to all appearance, they could not be executed in a much better manner in the present day, with all the conveniences which the copperplate printers now possess, and the additional knowledge they must necessarily have acquired in the course of more than three centuries. Hence we may fairly conclude, that if they were not the first specimens of the engravers' workmanship, they were much less the first efforts of the copperplate printer's ability. It is likewise to be observed, that Martin Schoen, who is said, with great appearance of truth, to have worked from 1460 to 1486, was apparently the scholar of Stoltzhiirs; for he followed his style of engraving, and copied from him a set of prints, representing the passion of our Saviour. Now, allowing Stoltzhiirs to have preceded his disciple only ten years, this carries the era of the art back to 1450, as was said above. There is no ground to suppose that it was known to the Italians till at least ten years afterwards. The earliest prints that are known to be theirs are a set of the seven planets, and an almanack by way of frontispiece; on which are directions for finding Easter from the year 1465 to 1517 inclusive: and we may be well assured, that the engravings were not antedated, for the almanack of course became less and less valuable every year. In all probability, therefore, these prints must have been executed in the year 1464, which is only four years later than the Italians themselves lay any claim to. The three earliest Italian engravers are, Finiguerra, Boticelli, and Baldini. If we are to refer these prints to any of the three, we shall naturally conclude them to be the work of Finiguerra or Baldini; for they are not equal either in drawing or composition to those ascribed to Boticelli, which we know at least were designed by him; and as Baldini is expressly said to have worked from the de-

signs of Boticelli, it will appear most probable that they belong to Finiguerra. With respect to the invention of *etching*, it seems to be not well known to whom it is to be ascribed. One of the most early specimens is that print by Albert Durer, known by the name of the *Cannon*, dated 1518, and thought by some, with little foundation, to have been worked on a plate of iron. Another etching by the same artist is Moses receiving the Tables of the Law, dated 1524. It was also practised in Italy soon after this by Parmegiano, in whose etchings we discover the hand of the artist working out a system as it were from his own imagination, and striving to produce the forms he wanted to express. We see the difficulty he laboured under; and cannot doubt, from the examination of the mechanical part of the execution of his works, that he had no instruction; and that it was something entirely new to him. If the story is true, that he kept an engraver by profession in his house, the novelty of the art is rendered so much the more probable. He died in 1540.

As to that species of engraving in which the modes of *etching* and *cutting* with the graver are united, it must have been found necessary immediately upon the invention of etching; it was, however, first carried to perfection by G. Audan, and is now almost universally practised, whether the work is in strokes or in dots.

Engraving in *dots*, the present fashionable method, is a very old invention, and the only mode discovered by the Italians. Agostino de Musis, commonly called *Augustine of Venice*, a pupil of Marc Antonio, used it in several of his earliest works, but confined it to the flesh, as in the undated print of An Old Man seated upon a Bank, with a Cottage in the back ground. He flourished from 1509 to 1536. We also find it in a print of "A single Figure standing, holding a Cup and looking upwards," by Giulio Campagnola, who engraved about the year 1516. The back ground is executed with round dots, made apparently with a dry point. The figure is outlined with a stroke deeply engraved, and finished with dots, in a manner greatly resembling those prints which Demarteau engraved at Paris in imitation of red chalk. The hair and beard are expressed by strokes. Stephen de Laune, a native of Germany, followed the steps of Campagnola; and many of his slight works are executed in dots only. John Boulanger, a French artist, who flourished in the middle of the last century, and his contemporary Nicholas Van Plattenberg, improved greatly on this method, and practised it with much success. It is only, however, of late, that it has been considered as an object worthy of general imitation. John Lutma executed this kind of work with a hammer and a small punch or chisel.

The method of engraving in *mezzotinto* was invented about the middle of the 17th century; and the invention has generally been attributed to Prince Rupert, though it has also been asserted that he learnt the secret from another. See *MEZZOTINTO*.

Engraving in *aquatinta* is quite a recent invention, and seems at once to have been carried to perfection by Sandby and other living artists. See *AQUATINTA*.

En-

Engraving.

Engraving with the tool was the kind originally practiced, and it is yet retained for many purposes. For though the manœuvre of etching be more easy, and other advantages attend it; yet where great regularity and exactness of the stroke or lines are required, the working with the graver is much more effectual: on which account it is more suitable to the precision necessary in the execution of portraits; as there every thing the most minute must be made out and expressed, according to the original subject, without any license to the fancy of the designer in deviating from it, or varying the effect either by that masterly negligence and simplicity in some parts, or those bold sallies of the imagination and hand in others, which give spirit and force to history-painting.

The principal instruments used in engraving with the tool are, graters, scrapers, a burnisher, an oil-stone, and a cushion for bearing the plates.

Graters are made in several forms with respect to the points, some being square, others lozenge; the square grater for cutting broad and deep, and the lozenge for more delicate and fine strokes and hatches. La Basse recommends, as the most generally useful, such as are of a form betwixt the square and lozenge; and he advises, that they should be of a good length; small towards the point, but stronger upwards, that they may have strength enough to bear any stress there may be occasion to lay upon them: for if they be too small and mounted high, they will bend; which frequently causes their breaking, especially if they be not employed for very small subjects.

The burnisher is used to assist in the engraving on some occasions, as well as to polish the plates. It is seven inches in length, and made of fine steel well polished. The burnisher is formed at one end, and a scraper on the other, each about an inch and a half long from the point: betwixt them, about four inches of the instrument is made round, and serves as a handle; and is thicker in the middle than at the necks, where the burnisher and scraper begin, which necks are only one quarter of an inch in diameter. The principal application of it in engraving, besides its use in polishing the plates, is to take out any scratches or accidental defacements that may happen to the plates during the engraving; or to lessen the effect of any parts that may be too strongly marked in the work, and require to be taken down.

A cushion, as it is called, is likewise generally used for supporting the plate in such a manner, that it may be turned every way with ease. It is a bag of leather filled with sand, which should be of the size that will best suit the plates it is intended to bear. They are round, and about nine inches over, and three inches in thickness.

The cushion, made as above directed, being laid on the table, the plate must be put upon it; and the graver being held in the hand in a proper manner, the point must be applied to the plate, and moved in the proper direction for producing the figures of the lines intended: observing, in forming straight lines, to hold the plate steady on the cushion; and where they are to be finer, to press more lightly, using greater force where they are to be broader and deeper. In making circular or other curve lines, hold your hand and graver steadily; and as you work, turn

your plate upon the cushion against your graver, otherwise it will be impossible for you to make any circular or curved line with that exactness and command of hand you by this means may. After part of the work is engraved, it is necessary to scrape it with the scraper or graver, passed in the most level direction over the plate to take off the roughness formed by the cutting of the graver; but great care must be taken not to incline the edge of the scraper or tool used, in such a manner that it may take the least hold of the copper, as it would otherwise produce false strokes or scratches in the engraving; and that the engraved work may be rendered more visible, it may afterwards be rubbed over with a roll of felt dipped in oil. In using the graver, it is necessary to carry it as level as possible with the surface of the plate; for otherwise, if the fingers slip betwixt them, the line that will be produced, whether curve or straight, will become deeper and deeper in the progress of its formation; which entirely prevents strokes being made at one cut, that will be fine at their extremities, and larger in the middle; and occasions the necessity of retouching to bring them to that state. For this reason, it is very necessary for those who would learn to engrave in perfection, to endeavour, by frequent trials, to acquire the habit of making such strokes both straight and curving, by lightening or sinking the graver with the hand, according to the occasion. If, after finishing the design, any scratches appear, or any part of the engraving be falsely executed, such scratches, or faulty parts, must be taken out by the burnisher, and further polished, if necessary, by the above mentioned roll.

The plate being thus engraved, it is proper to round off the edges, by using first a rough file, and afterwards a smoother; and to blunt the corners a little by the same means: after which, the burnisher should be passed over the edges to give it a farther polish.

The dry point, or needle, which has been of late much used in engraving, is a tool like an etching point, which being drawn hard on the copper, cuts a stroke, and raises a burr; the burr is scraped off, and there remains a stroke more soft and delicate than can be produced in any other way.

In the conduct of the graver and dry point consists all the art; for which there are no rules to be given; all depending on the habitude, disposition, and genius, of the artist. However, besides the explanations already given, some general observations and directions may not be improper. As the principles of engraving are the same with those of painting, a person cannot expect to attain any considerable degree of perfection in this art who is not a good master of design; and therefore he ought to be well acquainted both with perspective and architecture: for the former, by the proper gradations of strong and faint colours, will enable him to throw backwards the figures and other objects of the picture or design which he proposes to imitate; and the latter will teach him to preserve the due proportion of its several orders, which the painter often entrusts to the discretion of the engraver. In order to preserve equality and union in his works, the engraver should always sketch out the principal objects of his piece before he undertakes to finish them. In working, the strokes of the graver should never be crossed too much in a lozenge manner, particularly in
the

Engraving.

Engraving. the representation of flesh, because sharp angles produce the unpleasant effect of lattice-work, and take from the eye the repose which is agreeable to it in all kinds of picturesque designs: we should except the case of clouds, tempests, waves of the sea, the skins of hairy animals, or the leaves of trees, where this method of crossing may be admitted. But in avoiding the lozenge, it is not proper to get entirely into the square, which would give too much of the hardness of stone. In conducting the strokes, the action of the figures, and of all their parts, should be considered; and it should be observed how they advance towards, or recede from the eye; and the graver should be guided according to the risings or cavities of the muscles or folds, making the strokes wider and fainter in the light, and closer and firmer in the shades. Thus the figures will not appear jagged; and the hand should be lightened in such a manner, that the outlines may be formed and terminated without being cut too hard; however, though the stroke break off where the muscle begins, yet they ought always to have a certain connection with each other, so that the first stroke may often serve by its return to make the second, which will show the freedom of the engraver.

In engraving the flesh, the effect may be produced in the lighter parts and middle tints by long pecks of the graver, rather than by light lines; or by round dots; or by dots a little lengthened by the graver; or, best of all, by a judicious mixture of these together.

In engraving the hair and the beard, the engraver should begin his work by laying the principal grounds, and sketching the chief shades in a careless manner, or with a few strokes; and he may finish it at leisure with finer and thinner strokes to the extremities. When architecture or sculpture is to be represented, except it be old and ruinous buildings, the work ought not to be made very black; because, as edifices are commonly constructed either of stone or white marble, the colour, being reflected on all sides, does not produce dark or brown shades as in other substances. White points must not be put in the pupils of the eyes of figures, as in engravings after paintings; nor must the hair or beard be represented as in nature, which makes the locks appear flowing in the air; because in sculpture there can be no such appearances.

In engraving cloths of different kinds, linen should be done with finer and closer lines than other sorts, and be executed with single strokes. Woollen cloth should be engraved wide, in proportion to the coarseness or fineness of the stuff, and with only two strokes; and when the strokes are crossed, the second should be smaller than the first, and the third than the second. Shining stuffs, which are generally of silk or satin, and which produce flat and broken folds, should be engraved more hard and more straight than others, with one or two strokes, as their colours are bright or brown; and between the first strokes other smaller must be joined, which is called interlining. Velvet and plush are expressed in the same manner, and should always be interlined. Metals, as armour, &c. are also represented by interlining, or by clear single strokes. In architecture, the strokes which form the rounding object should tend to the point of light; and when

whole columns occur, it is proper to produce the effect as much as possible by perpendicular strokes. If a gross stroke is put, it should be at right angles, and wider and thinner than the first stroke. In engraving mountains, the strokes ought to be frequently discontinued and broken, for sharp and craggy objects; and they should be straight, in the lozenge manner, and accompanied with long points or dots; and rocks should be represented by cross strokes more square and even. Objects that are distant towards the horizon should be kept very tender, and slightly charged with black. Waters that are calm and still are best represented by strokes that are straight, and parallel to the horizon, interlined with those that are finer; omitting such places as, in consequence of gleams of light, exhibit the shining appearance of water; and the form of objects reflected from the water, at a small distance upon it, or on the banks of the water, are expressed by the same strokes, retouched more strongly or faintly as occasion may require, and even by some that are perpendicular. For agitated waters, as the waves of the sea, the first strokes should follow the figure of the waves, and may be interlined, and the cross strokes ought to be very lozenge. In cascades, the strokes should follow the fall, and be interlined. In engraving clouds, the graver should sport when they appear thick and agitated, in turning every way according to their form and their agitation. If the clouds are dark, so that two strokes are necessary, they should be crossed more lozenge than the figures, and the second strokes should be rather wider than the first. The flat clouds, that are lost insensibly in the clear sky, should be made by strokes parallel to the horizon, and a little waving; if second strokes are required, they should be more or less lozenge; and when they are brought to the extremity, the hand should be so lightened, that they may form no outline. The flat and clear sky is represented by parallel and straight strokes, without the least turning. In landscapes, the trees, rocks, earth, and herbage, should be etched as much as possible; nothing should be left for the graver but perfecting, softening, and strengthening. The dry point produces an effect more delicate than the graver can, and may be used to great advantage in linen, skies, distances, ice, and often in water, especially in small engravings. In most things it is proper to etch the shadows, only leaving the lighter tints for the dry point, graver, &c.

To imitate *chalk-drawings*, a mixture of varied and irregular dots are used, made more or less lost, so as to resemble the grain produced by the chalks on paper. Every stroke of the chalks on paper may be considered as an infinite number of adjoining points, which are the small eminences of the grain of the paper touched by the chalk in passing over it. When the copper-plate has been polished and varnished, or properly prepared, as in the common method of engraving, the drawing to be imitated may be counterproved on the varnish of the plate. If this cannot be conveniently done, black lead pencil, or red chalk, must be applied to varnished or oiled paper; and by means of this chalk or pencil, all the traces of the original will be transmitted to the varnish. The outlines of the object must be formed in the etching by points, whose magnitude and distance must be determined by the quality of the strokes in the original

Engraving. ginal drawing. The artist may be provided with pointed instruments or needles of various sizes with single or double points. In forming the light and shade, he should distinguish between those hatches which serve to express the perspective of the object and those which form the ground of it. The principal hatches should be more strongly marked; the middle tints, if etched, should be marked lightly, or they may be left till the varnish is taken off, and be perfected with a greater degree of softness, by needles or the point of the graver, as the original may require. There is nothing peculiar in the method of applying the aquafortis in this kind of engraving; but it may be observed, that it should not be left so long as to corrode the lighter parts too much: if the light parts are sufficiently corroded, they may be stopped out with turpentine varnish and lamp-black mixed together, and the aquafortis may be applied again to the stronger parts; for it will be no detriment to them, if the points which compose the shade burst into one another, provided the extreme be avoided. When the work of the aquafortis is finished, and the varnish taken off the copper, it will be necessary in the softest parts, such as the flesh, &c. to intertipple with proper points; as an effect will be thus produced more delicate than it is possible to attain with the aquafortis only; and the strongest shades will require additional strength to be given them with small strokes of the graver. Drawings made with chalks of different colours may be imitated in this manner, if a plate be provided for every colour.—This method of engraving is intended to form a kind of deception, so that the connoisseur may not be able, on the first inspection, to distinguish between the original drawing and the engraving made in imitation of it; and it is extremely useful, as it serves to multiply copies of drawings left by those masters who excelled in the use of chalks, and thus to form and improve young artists, who could not have access to the originals in the practice of drawing.

Engraving upon Glass. See CHEMISTRY, 2d N° 857.

Engraving on Precious Stones, is the representing of figures, or devices, in relief or indented, on divers kinds of hard polished stones.

The art of engraving on precious stones is one of those wherein the ancients excelled; there being divers antique agates, cornelians, and onyxes, which surpass any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioscorides under the first emperors of Rome, are the most eminent engravers we read of: the former was so esteemed by Alexander, that he forbade any body else to engrave his head; and Augustus's head, engraven by the latter, was deemed so beautiful, that the succeeding emperors chose it for their seal.

All the polite arts having been buried under the ruins of the Roman empire, the art of engraving on stones met with the same fate. It was retrieved in Italy at the beginning of the 15th century, when one John of Florence, and after him Dominic of Milan, performed works of this kind no way to be despised. From that time, such sculptures became common enough in Europe, and particularly in Germany, whence great numbers were sent into other countries: but they came short of the beauty of those of the ancients, espe-

cially those on precious stones; for, as to those on crystal, the Germans, and, after their example, the French, &c. have succeeded well enough.

In this branch of engraving, they make use either of the diamond or of emery.

The diamond, which is the hardest of all stones, is only cut by itself, or with its own matter. The first thing to be done in this branch of engraving is, to cement two rough diamonds to the ends of two sticks big enough to hold them steady in the hand, and to rub or grind them against each other till they be brought to the form desired. The dust or powder that is rubbed off serves afterwards to polish them, which is performed with a kind of mill that turns a wheel of soft iron. The diamond is fixed in a brass dish; and, thus applied to the wheel, is covered with diamond dust, mixed up with oil of olives; and when the diamond is to be cut facet-wise, they apply first one face, then another, to the wheel. Rubies, sapphires, and topazes, are cut and formed the same way on a copper wheel, and polished with tripoli diluted in water. As to agates, amethysts, emeralds, hyacinths, granites, rubies, and others of the softer stones, they are cut on a leaden wheel, moistened with emery and water, and polished with tripoli on a pewter wheel. Lapis-lazuli, opal, &c. are polished on a wooden wheel. To fashion and engrave vases of agate, crystal, lapis-lazuli, or the like, they make use of a kind of lathe, like that used by pewterers, to hold the vessels, which are to be wrought with proper tools: that of the engraver generally holds the tools, which are turned by a wheel; and the vessel is held to them to be cut and engraved, either in relief or otherwise; the tools being moistened from time to time with diamond dust and oil, or at least emery and water. To engrave figures or devices on any of these stones, when polished, such as medals, seals, &c. they use a little iron wheel, the ends of whose axis are received within two pieces of iron, placed upright, as in the turner's lathe; and to be brought closer, or set further apart, at pleasure; at one end of the axis are fitted the proper tools, being kept tight by a screw. Lastly, The wheel is turned by the foot, and the stone applied by the hand to the tool, and is shifted and conducted as occasion requires.

The tools are generally of iron, and sometimes of brass; their form is various, but it generally bears some resemblance to chisels, gouges, &c. Some have small round heads, like buttons, others like ferrets, to take the pieces out, and others flat, &c. When the stone has been engraven, it is polished on wheels of hair-brushes and tripoli.

Engraving on Steel is chiefly employed in cutting seals, punches, matrices, and dyes, proper for striking coins, medals, and counters. The method of engraving with the instruments, &c. is the same for coins as for medals and counters: All the difference consists in their greater or less relief; the relief of coins being much less considerable than that of medals, and that of counters still less than that of coins.

Engravers in steel commonly begin with punches, which are in relief, and serve for making the creux or cavities of the matrices and dyes: though sometimes they begin with the creux or hollows; but then it is only when the intended work is to be cut

Enquiche

Enixum

very shallow. The first thing done, is that of designing the figures; the next is the moulding them in wax, of the size and depth they are to lie, and from this wax the punch is engraven. When the punch is finished, they give it a very high temper, that it may the better bear the blows of the hammer with which it is struck to give the impression to the matrice.

The steel is made hot to soften it, that it may the more readily take the impression of the punch; and after striking the punch on it in this state, they proceed to touch up or finish the strokes and lines, where by reason of their fineness or the too great relieve they are any thing defective, with steel gravers of different kinds, chisels, flatters, &c. being the principal instruments used in graving on steel.

The figure being thus finished, they proceed to engrave the rest of the medal, as the mouldings of the border, the engraved ring, letters, &c. with little steel punches, well tempered, and very sharp.

ENQUICHE', in heraldry, is said of the great mouth of a hunting horn, when its rim is of a different colour from that of the horn itself.

ENHARMONIC, in music. The Greeks had three different species of music; the *diatonic*, the *chromatic*, and the *enharmonic*. This last was esteemed by much the most agreeable and powerful of the three; but the difficulty of its execution rendered its duration short, and latter artists were upbraided for having sacrificed it to their indolence. It proceeded upon lesser intervals than either the diatonic or chromatic; and as the chromatic semitone is still less than the diatonic, the *enharmonic* intervals must have consisted of that semitone divided into parts more minute. In Rousseau's Musical Dictionary (at the word *Enharmonique*), the reader may see how that interval was found in the tetrachords of the ancients. It is by no means easy for modern ears, inured to intervals so widely different, to imagine how a piece of music, whose transitions were formed either chiefly or solely upon such minute divisions, could have such wonderful effects; yet the melody of speech, which rises or falls by intervals still more minute than the *enharmonic*, when properly modulated and applied with taste, has an astonishing power over the soul. As to the modern *enharmonic* system, we may likewise refer the reader to the same work for an account of its nature and use; though he will find it accurately and clearly explained by D'Alembert, in the Treatise of Music given in the present work, (art. 144. 145. 146.)

ENHYDRUS, in natural history, a genus of siderochita or crustated ferruginous bodies, formed in large and in great part empty cases, inclosing a small quantity of an aqueous fluid.

Of this genus there are only two species: 1. The thick-shelled enhydrus, with black, reddish-brown, and yellow crusts. 2. The thinner-shelled kind, with yellowish-brown and purple crusts; neither of which ferments with aquafortis or gives fire with steel.

ENIGMA. See *ÆNIGMA*.

ENIXUM, among chemists, a kind of natural salt, generated of an acid and an alkali.

The sal enixum of Paracelsus, is the caput mortuum of spirits of nitre with oil of vitriol, or what remains in the retort after the distillation of this spirit; being of a white colour, and pleasing acid taste.

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ENMANCHE', in heraldry, is when lines are drawn from the centre of the upper edge of the chief to the fides, to about half the breadth of the chief; signifying *sleeve*, or resembling a sleeve, from the French *manche*.

Enmanche

Enoch.

ENNA, (anc. geog.), a town of Sicily, situated on an eminence to the south of the Chrysis; called the *centre of Sicily*. It was famous for a sacred grove, in which the rape of Proserpina happened; for a temple of Ceres, thence surnamed *Ennaea*, and *Ennesus*; and for fine springs, whence the name (Bochart.)

ENNEAGON, in geometry, a polygon with nine sides. See *POLYGON*.

ENNEAHEDRIA, in natural history, a genus of columnar, crystalliform, and double-pointed spars, composed of a trigonal column, terminated at each end by a trigonal pyramid.

Of this genus there are several species, distinguished by the length or shortness of the column and pyramids, none of which give fire with steel, but all of them ferment with aquafortis. See *SPAR*.

ENNEANDRIA, in botany (from *ennea* nine, and *andros* a man or husband), the name of the ninth class in Linnaeus's sexual system, consisting of plants which have hermaphrodite flowers with nine stamina or male organs. See *BOTANY*, p. 430. the *Scheme*.

ENNIUS (Quintus), an ancient Latin poet, born at Rudii, a town in Calabria. He came first to Rome when M. Porcius Cato was questor, whom he had instructed in the Greek language in Sardinia; and by his genius and behaviour he gained the esteem of the most eminent persons in the city. According to Horace, Ennius never applied himself to writing till he had drunk freely of wine. Hence he contracted the gout, of which he died nine years B. C. He was interred in Scipio's sepulchre; who had a great esteem and friendship for him, and caused a statue to be erected to him upon his monument. He endeavoured to introduce the treasures of the Greek tongue among the Latins, and was the first among the Romans who made use of heroic verses. He wrote the *Annals of Rome*; he translated several tragedies from the Greek, and wrote others, besides several comedies. We have only some fragments of his works, which were first collected by the two Stephens, and afterwards published at Naples, with a learned commentary, by Jerom Columna, in quarto, 1590; and reprinted at Amsterdam in 1707, in quarto, with additions by Hefsius.

ENOCH, the son of Cain (Gen. iv. 17.), in honour of whom the first city taken notice of in scripture was called *Enoch* by his father Cain, who built it. It was situated to the east of the province of Eden.

ENOCH, the son of Jared and father of Methuselah, was born in the year of the world 622. At the age of 65 he begat Methuselah, and lived 300 years after, and had several sons and daughters. Enoch walked with God; and after that he had lived in all 365 years, "he was not, for God took him." Some construe these last words, as if they intimated that Enoch died a natural death, because in reality he lived not near so long as the other patriarchs of those times; as if God, to secure him from corruption, had

Enoch
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Eub.

been pleased to take him early out of this world. But the generality of the fathers and commentators assert that he died not, but was translated out of the sight of men, in like manner as Elijah was. The apostle Paul (Heb. xi. 5.) shows very clearly that Enoch was translated, and did not see death.

The apostle Jude (ver. 14, 15.) cites a passage from the book of Enoch, which has very much exercised interpreters. The question is, whether the apostle took this passage out of any particular book written by Enoch, which might be extant in the first ages of the church? whether he received it by tradition? or lastly, by some particular revelation? It is thought probable, that he read it in the book we have been speaking of, which, tho' apocryphal, might contain several truths that St Jude, who was favoured with a supernatural degree of understanding, might make use of to the edification of the faithful.

The ancients generally esteemed the prophecy of Enoch. Tertullian expresses his concern, that it was not generally received in the world. That father, on the authority of this book, deduces the original of idolatry, astrology, and unlawful arts, from the revolted angels, who married with the daughters of men. St Augustin allows indeed that Enoch wrote something divine, because he is cited by St Jude; but he says it was not without reason that this book was not inserted in the canon which was preserved in the temple at Jerusalem. This father sufficiently insinuates, that the authority of this book is doubtful, and that it cannot be proved that it was really written by Enoch. Indeed the account it gives of giants engendered by angels, and not by men, has manifestly the air of a fable, and the most judicious critics believe it ought not to be ascribed to Enoch.

This apocryphal book lay a long time buried in darkness, till the learned Joseph Scaliger recovered a part of it. Scaliger, Vossius, and other learned men, attribute this work to one of those Jews who lived between the time of the Babylonish captivity and that of Jesus Christ. Others are of opinion, that it was written after the rise and establishment of Christianity, by one of those fanatics with whom the primitive church was filled, who made a ridiculous mixture of the Platonic philosophy and the Christian divinity.

The eastern people, who call Enoch by the name of *Edris*, believe that he received from God the gift of wisdom and knowledge; and that God sent him 30 volumes from heaven, filled with all the secrets of the most mysterious sciences. The Rabbins maintain, that when Enoch was translated to heaven, he was admitted into the number of the angels, and is the person generally known by the name of *Michael*.

ENORMOUS, something excessive or monstrous, especially in bulk.—The word is formed of the privative *e*, and *norma*, "rule;" q. d. "void of, or contrary to, rule or measure;" *contra normam*. In the corrupt ages of Latinity, they used *inormis*, and *inormis*.

In the French jurisprudence, *leso enormis*, "enormous damage," is that which exceeds half the value of the thing sold.

ENOS, the son of Seth and father of Cainan, was born in the year of the world 235. Moses tells us (Gen. iv. 26.), that then "men began to call upon the name of the Lord;" or, as others translate it, that "Enos began to call upon the name of the

Lord;" that is to say, that he was the inventor of religious rites and ceremonies in the external worship which was paid to God. This worship was kept up and preserved in Enos's family, while Cain's family was plunged in all manner of irregularities and impieties. Several Jews are of opinion, that idolatry was at first introduced into the world in the time of Enos. They translate the Hebrew thus, "Then men began to profane the name of the Lord." Good men, to distinguish themselves from the wicked, began to take upon them the quality of sons or servants of God; for which reason, Moses (Gen. vi. 1, 2.) says, that the *sons of God* (that is to say, the descendants of Enos, who had hitherto preserved the true religion), seeing the daughters of men, that they were fair, took them wives of all which they chose. Enos died at the age of 905 years, in the year of the world 1140.

ENS, among metaphysicians, denotes entity, being, or existence: thus the schools call *ens reale*, and *ens positivum*; to distinguish it from their *ens rationis*, which is only an imaginary thing, or exists but in the imagination.

ENSs, among chemists, imports the power, virtue, and efficacy, which certain substances exert upon our bodies.

ENS, in geography, a city of Germany, situated at the confluence of the Danube and the river Enns, about 80 miles south of Vienna. E. Long. 14. 20. N. Lat. 48. 16.

ENSATÆ, in botany (from *ensis*, "a sword"); the name of the sixth order in Linneus's natural method, consisting of plants with sword-shaped leaves. * See Bo. It contains the following genera, viz. Antholyza, Callisia, Commelina, Crocus, Eriocaulon, Ferraria, Gladiolus, Iris, Ixia, Moraea, Pontæderia, Sisyrinchium, Tradescantia, Wachendorffia, Xyris.

ENSEELED, in falconry, is said of a hawk that has a thread drawn through her upper eye-lid, and made fast under her beak, to take away the sight.

ENSEMBLE, a French term, sometimes used in our language; literally signifying *together*, or *one with another*:—being formed from the Latin *in* and *simul*.

In architecture, we say the *ensemble*, or *tout ensemble*, of a building; meaning the whole work, or composition, considered together, and not in parts; and sometimes also, the relative proportion of the parts to the whole.—"All those pieces of building make a fine ensemble."

To judge well of a work, a statue, or other piece of sculpture, one must first examine whether the *ensemble* be good. The *tout ensemble* of a painting, is that harmony which results from the distribution of the several objects or figures whereof it is composed.—"This picture is good, taking the parts separately; but the *tout ensemble* is bad."

ENSIFORMIS CARTILAGO. See XIPHOIDES.

ENSIGN, in the military art, a banner or colours under which soldiers are ranged, according to the different companies or parties they belong to. See FLAG, COLOURS, STANDARD, &c.

The Turkish ensigns are horses tails; those of the Europeans are pieces of taffety, with divers figures, colours, arms, and devices thereon. Xenophon tells us, that the ensign bore by the Persians was a golden eagle on a white flag; the Corinthians bore the winged horse, or Pegasus, in theirs; the Athenians, an owl; the

Ens
||
Eubign.

Ensign
||
Ete.

See Eagle

the Meffians, the Greek letter M; the Lacedæmonians, the Λ. The Romans had a great diversity of enfigs; the wolf, minotaur, horfe, boar, and at length the eagle, where they ftopped: this was firft affumed in the fecond year of the confulate of Marius †. A military enfign on a medal of a Roman colony, denotes it a colony peopled with old foldiers.

ENSIGN is alfo the officer that carries the colours, being the loweft commiffioned officer in a company of foot, fubordinate to the captain and lieutenant. It is a very honourable and proper poft for a young gentleman at his firft coming into the army: he is to carry the colours both in affault, day of battle, &c. and fhould not quit them but with his life: he is always to carry them himfelf on his left fhoulder: only on a march he may have them carried by a foldier. If the enfign is killed, the captain is to carry the colours in his head.

Naval ENIGN, a large ftandard or banner hoifted on a long pole erected over the poop, and called the *enfign ftaff*.—The enfign is ufed to diftinguifh the fhips of different nations from each other, as alfo to charaeterife the different fquadrons of the navy. The Britifh enfign in fhips of war is known by a double crofs, viz. that of St George and St Andrew, formed upon a field which is either red, white, or blue.

ENSIſHEIM, a town of France, in Upper Alface. It is a pretty little place, well built, and confifts of about 200 houfes. E. Long. 7. 41. N. Lat. 47. 49.

ENT (Sir George), an eminent Englifh phyfician, born at Sandwich in Kent in 1604. He was educated at Sidney college, Cambridge; and, afterwards travelling into foreign countries, received the degree of doctör of phyfic at Padua. After his return he obtained great practice, was made prefident of the college of phyficians in London, and at length received the honour of knighthood from King Charles II. He was extremely intimate with Doctör Harvey; whom he learnedly defended in a piece intitled, *Apologia pro Circulatione Sanguinis, contra Emiliũ Parifiannũ*. He alfo published, *Animadverſiones in Malacbie Thruſtonis*; and ſome obſervations in the Philoſophical Tranſactions. Glanville, ſpeaking of his Plus Ultra of the modern improvements in anatomy, numbers Sir George Ent, Doctör Glifton, and Doctör Wallis, with the moſt celebrated diſcoverers in that ſcience. The two former were among the firſt members of the Royal Society. Sir George Ent died in October 1689.

ENTABLATURE, or ENTABLEMENT, in architecture, is that part of an order of a column which is over the capital, and comprehends the architrave, frieze, and cornice. See ARCHITECTURE, chap. i.

ENTABLER, in the manege, the fault of a horſe whoſe croupe goes before his ſhoulders in working upon volts; which may be prevented by taking hold of the right rein, keeping your right leg near, and removing your left leg as far from the horſe's ſhoulder as poſſible.

This is always accompanied with another fault called *aculer*. See ACULER.

ENTAIL, in law, ſignifies *ſettail*, or *fee entailed*; that is, abridged, curtailed, or limited, to certain conditions. See FEE, and TAIL.

ENTE, in heraldry, a method of marſhalling, more

frequent abroad than with us, and ſignifying 'grafted or ingrafted.'

We have, indeed, one inſtance of enté in the fourth grand quarter of his majeſty's royal enfig, whoſe blazon is Brunfwick and Lunenburg impaled with ancient Saxony, *enté en pointé*, "grafted in point."

ENTEROCÆLE, in ſurgery, a tumor formed by a prolapſion of the inteſtines through the rings of the abdomen and proceſſes of the peritonæum, into the ſcrotum. See SURGERY.

ENTHUSIASM, an ecſtaſy of the mind, whereby it is led to think and imagine things in a ſublime, ſurprizing, yet probable manner. This is the enthufiaſm felt in poetry, oratory, muſic, painting, ſculpture, &c.

ENTHUSIASM, in a religious ſenſe, implies a tranſport of the mind, whereby it fancies itſelf inſpired with ſome revelation, impuſe, &c. from heaven. Mr Locke gives the following deſcription of enthufiaſm. "In all ages, men in whom melancholy has mixed with devotion, or whoſe conceit of themſelves has raiſed them into an opinion of a great familiarity with God, and a nearer admittance to his favour than is afforded to others, have often flattered themſelves with a perſuaſion of an immediate intercourſe with the Deity, and frequent communications from the Divine Spirit. Their minds being thus prepared, whatever groundleſs opinion comes to ſettle itſelf ſtrongly upon their fancies, is an illumination from the Spirit of God. And whatſoever odd action they find in themſelves a ſtrong inclination to do, that impuſe is concluded to be a call or direction from heaven, and muſt be obeyed. It is a commiſſion from above, and they cannot err in executing it. This I take to be properly enthufiaſm, which, though ariſing from the conceit of a warm and overweening brain, works, when it once gets footing, more powerfully on the perſuaſions and actions of men, than either reaſon or revelation, or both together; men being moſt forwardly obedient to the impuſes they receive from themſelves." Devotion, when it does not lie under the check of reaſon, is apt to degenerate into enthufiaſm. When the mind finds itſelf inflamed with devotion, it is apt to think that it is not of its own kindling, but blown up with ſomething divine within it. If the mind indulges this thought too far, and humours the growing paſſion, it at laſt flings itſelf into imaginary raptures and ecſtaſies; and when once it fancies itſelf under the influence of a divine impuſe, no wonder if it ſlights human ordinances, and reſuſes to comply with the eſtabliſhed form of religion, as thinking itſelf directed by a much ſuperior guide.

ENTHUSIAST, a perſon poſſeſſed with enthufiaſm. See the preceding article.

ENTHYMEME, in logic and rhetoric, an argument conſiſting only of two propoſitions, an antecedent, and a conſequent deduced from it. The word is Greek, *ενθυμημα*, formed of the verb *ενθυμιζω*, "to think, conceive," a compound of *εν* and *θυμας*, "mind."

The enthymeme is the moſt ſimple and elegant of all arguments; being what a man, in arguing cloſely, commonly makes, without attending at all to the form. Thus, that verſe remaining of Ovid's tragedy, intitled *Medea*, contains an enthymeme; *Scirene potui, perdere an poſſum rogas*: "I was able to ſave you; conſequently to have deſtroyed you." All the beauty

Enterocæle
||
Erthy-meme.

Enthymeme. would have been lost, had all the propositions been expressed; the mind is displeased with a rehearsal of what is no ways necessary.

Sometimes, also, the two propositions of an enthymeme are both included in a single proposition, which

Aristotle calls an *enthymematical sentence*, and gives this instance thereof: *Mortal, do not bear an immortal hatred.* The whole enthymeme would be, *Thou art mortal; let not, therefore, thy hatred be immortal.*

ENTITY, the same with ESS.

Entity.

E N T O M O L O G Y;

THE science of insects, or that part of zoology which treats of insects.

By some natural historians, this class of animals is considered as the most imperfect of any, while others prefer them to the larger animals. One mark of their imperfection is said to be, that many of them can live a long time, though deprived of those organs which are necessary to life in the higher ranks of nature. Many of them are furnished with lungs and an heart, like the nobler animals; yet the caterpillar continues to live, though its heart and lungs, which is often the case, are entirely eaten away.—It is not, however, from their conformation alone that insects are inferior to other animals, but from their instincts also. It is true, that the ant and the bee present us with striking instances of assiduity; yet even these are inferior to the marks of sagacity displayed by the larger animals. A bee taken from the swarm is totally helpless and inactive, incapable of giving the smallest variations to its instincts. It has but one single method of operating; and if put from that, it can turn to no other. In the pursuits of the hound, there is something like choice; but in the labours of the bee, the whole appears like necessity and compulsion.—All other animals are capable of some degree of education; their instincts may be suppressed or altered; the dog may be taught to fetch and carry, the bird to whistle a tune, and the serpent to dance: but the insect has only one invariable method of operating; no arts can turn it from its instincts; and indeed its life is too short for instruction, as a single season often terminates its existence.—Their amazing number is also an imperfection. It is a rule that obtains through all nature, that the nobler animals are slowly produced, and that nature acts with a kind of dignified economy; but the meaner births are lavished in profusion, and thousands are brought forth merely to supply the necessities of the more favourite part of the creation. Of all productions in nature, insects are by far the most numerous. The vegetables which cover the surface of the earth bear no proportion to the multitudes of insects; and though, at first sight, herbs of the field seem to be the parts of organized nature produced in the greatest abundance, yet, upon more minute inspection, we find every plant supporting a mixture of scarce perceptible creatures, that fill up the compass of youth, vigour, and age, in the space of a few days existence.—In Lapland, and some parts of America, the insects are so numerous, that if a candle is lighted they swarm about it in such multitudes, that it is instantly extinguished by them; and in these parts of the world, the miserable inhabitants are forced to smear their bodies and faces with tar, or some other unctuous composition, to protect them from the stings of their minute enemies.

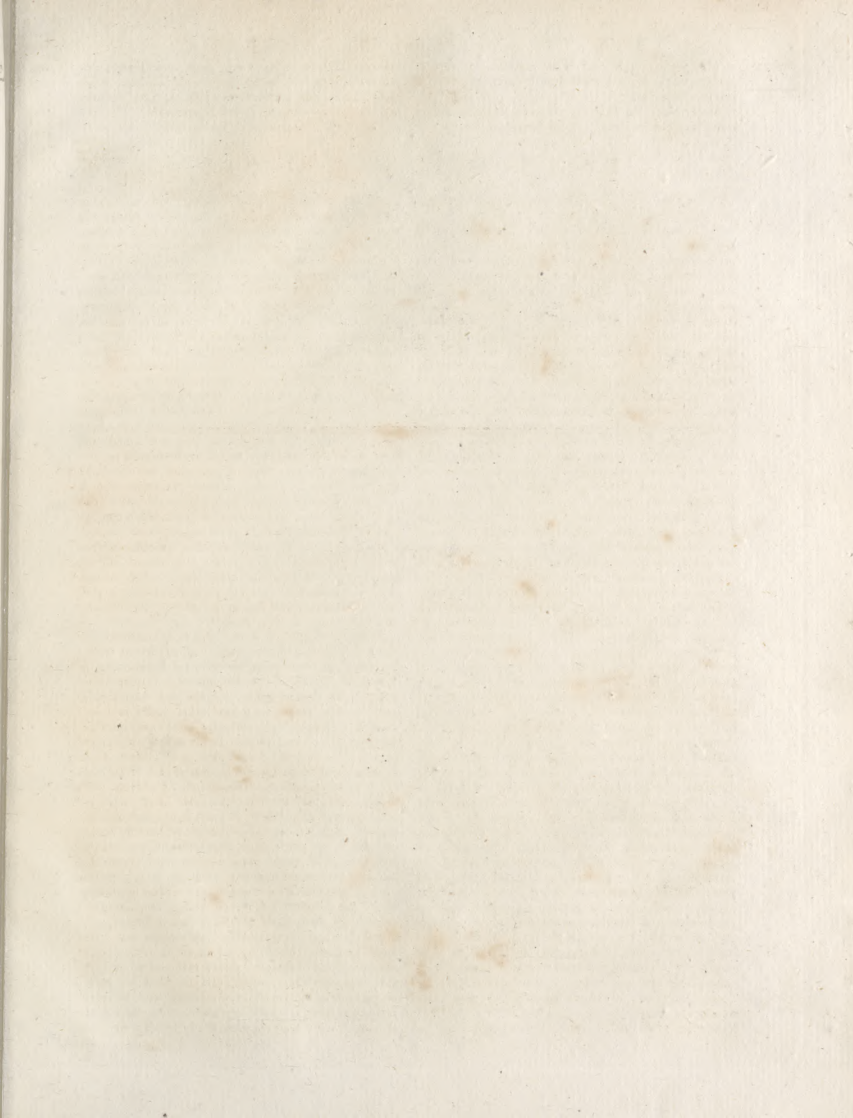
On the other hand, Swammerdam argues for the

perfection of insects in the following manner. “After an attentive examination (says he) of the nature and anatomy of the smallest as well as the largest animals, I cannot help allowing the least an equal, or perhaps a superior, degree of dignity. If, while we dissect with care the larger animals, we are filled with wonder at the elegant disposition of their parts, to what an height is our astonishment raised, when we discover all these parts arranged, in the least, in the same regular manner! Notwithstanding the smallness of ants, nothing hinders our preferring them to the largest animals, if we consider either their unwearied diligence, their wonderful strength, or their inimitable propensity to labour. Their amazing love to their young is still more unparalleled among the larger classes. They not only daily carry them to such places as may afford them food; but if by accident they are killed, and even cut into pieces, they will with the utmost tenderness carry them away piecemeal in their arms. Who can show such an example among the larger animals which are dignified with the title of *perfect*? Who can find an instance in any other creature that can come in competition with this?”

On this dispute it is only necessary to observe, that the wisdom of the Creator is so conspicuous in all his works, and such surprising art is discovered in the mechanism of the body of every creature, that it is very difficult, if not impossible, to say where it is most, and where it is least, to be observed.

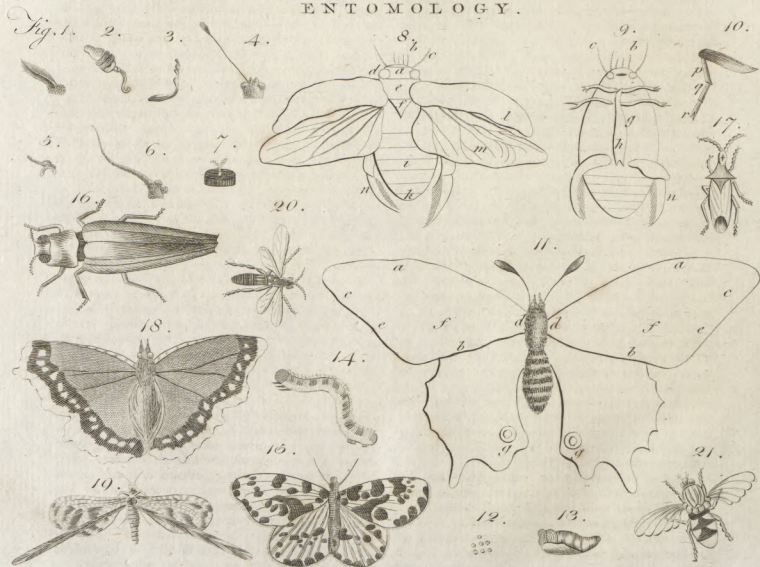
Whoever is desirous of attaining a systematic knowledge of insects, ought primarily to be solicitous about acquiring the terms made use of in the science, that so he may be able rightly to denominate every part of an insect. The student is first to know what an insect is, lest he mistake hippocampi, and other amphibious animals, for them, as was formerly done; or confound them with the *vermes*, which Linnaeus first distinguished from insects, and which differ as essentially from them as the class mammalia do from birds. Every insect is furnished with a head, antennae, and feet, of all which the *vermes* are destitute. All insects have six or more feet; they respire through pores placed on the sides of their bodies, and which are termed *spiracula*: their skin is extremely hard, and serves them instead of bones, of which they have internally none. From this definition, the *acus marina* is evidently no insect. But the antennae placed on the fore-part of the head, constitute the principal distinction. These are jointed and moveable in every part, in which they differ from the horns of other animals: they are organs conveying some kind of sense; but we have no more idea of what this kind of sense is, than a man has, who, without eyes, attempts to determine the particular action of the rays of light on the retina of the eye, or to explain the changes which from thence take place in the human mind. That they are the organs of some kind

of





ENTOMOLOGY.



Organs of hearing, &c.

of sense, is apparent from their perpetually moving them forward; yet the hard crust with which they are invested, and their shortness in flies and other insects, would induce one to believe them not to be the organs of touch: Mr Barbut supposes them to constitute or to contain the organs of hearing. That they are tubular, and filled with air, and some kind of humour, appears from the antennæ of butterflies immersed in water.—To come now to the terms of the art. A knowledge of the external parts of the body is first to be established; which, after the method of anatomists, we divide into head, trunk, abdomen, and extremities.

SECT. I. *External Parts of the Body.*

Fundamenta Entomologiae. v. I. Bladh, A. mæd. acad. n° 133.

I. CAPUT, the HEAD. This part in insects without brain. The difference between the brain and spinal marrow consists in the former being a medullary part organized. We do not deny the existence of a medullary thread in the heads of insects, but we never could discover it to be organized: hence the hippocæna, or horse fly, will live, run, may even copulate, after being deprived of its head; to say nothing of many others which are capable of living a long while in the same situation.

As they are not apparently furnished with ears, they have been apprehended incapable of hearing; as we can no more conceive that sense to exist without ears than vision without eyes. That they are nevertheless susceptible of any shrill or loud noise, as well as fishes, is indubitable; but it has been supposed to be in a manner different from that of hearing. Mr Barbut, however, supposes them to possess this sense in a very distinct manner. Many insects, he observes, are well known to be endowed with the power of uttering sounds, such as large beetles, the bee, wasp, common fly, gnat, &c. The sphinx atropos squeaks, when hurt, nearly as loud as a mouse. Now, if insects are endowed with the power of uttering sounds, it certainly must be for some purpose. As they vary their cry occasionally, it must certainly be designed either to give notice of pleasure or pain, or some affection in the creature who possesses it. “The knowledge of their sounds (says our author) is undoubtedly confined to their tribe, and is a language intelligible to them only; saving when violence obliges the animal to exert the voice of nature in distress, craving compassion; then all animals understand the doleful cry. For instance, attack a bee or wasp near the hive or nest, or a few of them: the consequence of that assault will be, the animal or animals, by a different tone of voice, will express his or their disapprobation or pain; that sound is known to the hive to be plaintive, and that their brother or brethren require their assistance; and the offending party seldom escapes with impunity. Now, if they had not the sense of hearing, they could not have known the danger their brother or brethren were in by the alteration of their tone.”

Another proof, which he reckons still more decisive, was taken from an observation made by himself on a large spider in St James's Park. This creature had made a very large web on a wooden railing; and was, at the time of observation, on one of the rails at a considerable distance from the place where a large fly entangled itself. Nevertheless, the moment the fly

was entangled, the spider became sensible of it; tho', from the situation of the rail, he could not possibly have seen it. In this, however, Mr Barbut might possibly be deceived; because the spider was perhaps alarmed by the tremulous motion of the threads, occasioned by the fluttering of the fly; which he might well know how to distinguish from their vibration by the wind. The organ of hearing, in our author's opinion, is situated in the antennæ; both from their situation in the part of the head most favourable to such organs, their inward structure being moveable, the ears of most inferior animals being so. He has never considered the antennæ as either offensive or defensive, but has observed them to be endowed with an exquisite sense of feeling; that the animal appeared to be in agony when its antennæ were pinched; and that it takes care to avoid the touching any hard substance with them roughly. “This tenderness in the organ of hearing (says he) is common to all animals; and insects seem to be particularly tender in these parts by quickly withdrawing them from the touch.”

Our author further observes, that the antennæ of all insects are composed of joints varying in size, form, and number. Those who are chiefly confined to live under water have their antennæ in general shorter than those who live on land. Some who roam at large in the air, have them long and slender. They are all hollow, and are rendered flexible by the joints, which are very visible in the horns of the crab and lobster. This hollowness, in our author's opinion, is to receive the sound communicated to the extremities of the antennæ by the repercussion of the air affected by any noise, and convey it, by means of the joints, from one to another, till it arrives in that lessened degree of tone best suited to the timid nature of the animal. In this circumstance there may be many variations in point of perfection in those organs; the strength, utility, and degree of power in receiving sound being proportioned to the necessities of the animals, different in their nature and requisites. In most animals, the entrance to the auricular organ is patulous; but in this case the animal would suffer great inconvenience from such an organization, as the organ would often be clogged with dirt, &c.

It has also appeared dubious if they have the sense of smell, no organ being found in them adapted to that purpose: and although it was evident they had a perception of agreeable and fetid effluvia, it was thought to be in a manner altogether unknown to us. Mr Barbut is of opinion that the organs of smell reside in the palpi or feelers. Many insects have four and some six, two of which are in general cheliform, in order to assist the insect in conveying its food to its mouth. It may be likewise observed, that the palpi are in continual motion; the animal thrusting them into every kind of putrid or other matter, as a hog would do his nose, smelling and searching after food. Insects which apparently do not possess palpi or spiral tongues, have undoubtedly some organ concealed within the mouth analogous to them in function and utility; the fleshy proboscis of the fly is thrust into every substance in which the animal expects to find food; and when it is extended, nearly in the middle are situated, in our author's opinion, two upright palpi, which, no doubt

doubt, perform in their turn some office, perhaps that of smell.

Many insects have no tongue, nor make any found with their mouth; but for this purpose some use their feet, others their wings, and others some elastic instrument with which they are naturally furnished.

EYES. Most insects have two; but the gyrinus has four, the scorpion six, the spider eight, and the scolopendra three. They have no eye-brows, but the external tunic of their eyes is hard and transparent like a watch-glass; their eyes have no external motion, unless it be in the crab. They consist for the most part of one lens only; but in those of the butterfly, diptera, and many of the beetles, they are more numerous. Pugett discovered 17,325 lenses in the cornea of a butterfly, and Lienenhook 800 in a fly.

ANTENNÆ. Of these there are in general two (unless four are allowed to some kind of crabs), and placed on the fore-part of the head: they are peculiar to insects; and are plainly distinguishable from the tentaculæ of the vermes, in being crustaceous; and from the palpi of insects, which are more numerous, placed near the mouth, and are sometimes wanting. As the antennæ are of great moment in distinguishing the various kinds of insects, we shall enumerate and explain the several different forms of them.

Scitaceæ, are those which grow gradually taper towards the extremity.

Filiformes, such as are of the same thickness throughout.

Moniliformes, are filiform, like the preceding, but consist of a series of round knobs, like a necklace of beads.

Clavate, such as gradually increase in size toward the extremity.

Capitate, are *clavate*, but have the extremity somewhat round.

Bifurcæ, are *capitate*; but have the capitulum, or knob, divided longitudinally into three or four parts, or laminae, as in the scarabæi.

Perfoliate, are also *capitate*; but have the capitulum horizontally divided, as in the dermestes.

Pesinate, so called from their similitude to a comb, though they more properly resemble a feather, as in the moth and elateres. This is most obvious in the male.

Aristate, such as have a lateral hair, which is either naked or furnished with lesser hairs, as in the *Cy; Brevisiores*, those which are shorter than the body; *longiores*, those which are longer than the body; *mediceres*, those which are of the same length with the body; all three of which varieties are distinguishable in the cerambyces.

PALPI, or *Feelers*, resemble filiform, articulated, moveable antennæ. They are most commonly four in number, sometimes six; they are sufficiently distinguished from antennæ, in being naked, short, and always placed at the mouth.

Os, the *Mouth*, is generally placed in the anterior part of the head, extending somewhat downwards. In some insects, it is placed under the breast, as in the chermes, coccus, cancer (crab), and curculio.

ROSTRUM, or *Proboscis*, is the mouth drawn out to a rigid point: in many of the hemiptera class it is bent downward toward the breast and belly, as in the

cicada, nepa, notonecta, cimex (bug), aphid, and remarkably so in some curculionides.

MAXILLÆ, the *Jaws*, are two in number, sometimes four, and at other times more; they are placed horizontally; the inner edge of them in some insects is serrated or furnished with little teeth.

LINGUA, the *Tongue*, in some insects is taper and spiral, as in the butterfly; in others it is fleshy, resembling a proboscis, and tubular, as in the fly.

LABIUM SUPERIUS, the *upper Lip*, is situated above the jaws; as in the scarabæus and gryllus.

STEMMATA, or *Crown*, are three smooth hemispheric dots, placed generally on the top of the head; as in most of the hymenoptera, and others.

II. TRUNCUS, the *TRUNK*, is that part which comprehends the breast or thorax: it is situated between the head and abdomen; and has the legs inserted into it, that its parts may be distinctly determined. It is divided into *thorax*, *scutellum*, and *sternum*.

THORAX, the *Thorax*, is the back part of the breast; and is very various in its shape. It is called *dentatus*, when its sides are armed with points; *spinifus*, when its back is furnished with them, as in the cerambyx; and *marginatus*, when its margin is laterally dilated, as in the silpha and cassida.

SCUTELLUM, or *Esfutcheon*, is the posterior part of the thorax: it is frequently triangular; and appears to be divided from the thorax by an intervening suture, as in most of the coleoptera.

STERNUM, the *Sternum*, is situated on the inferior part of the thorax; it is pointed behind in the elateres, and bifid in some of the dytisci.

III. ABDOMEN, the *ABDOMEN* is in most insects distinct from the thorax; it is the posterior part of the body of the insect; and is composed of a number of annular segments, which serve occasionally to lengthen or shorten it, and to contain the organs of chylication, &c.

SPIRACULA, are little holes or pores, placed singly on each side of every segment of the abdomen: thro' these the insect breathes; and if oil be applied so as to stop them up, it proves fatal to most of them.

TERGUM, the *Back*, is the superior part of the abdomen.

VENTER, the *Belly*, is the inferior part.

ANUS, is the posterior part of the abdomen, perforated for the evacuation of the excrement. This part also frequently contains the organs of generation.

IV. ARTUS, the *LIMBS* or *EXTREMITIES*, are the various instruments of motion.

PEDES, the *Legs*, are generally six. There is an exception to this, however, in the class Apteræ, many of which have eight; as acari (mites), phalangii, most of the aranei (spiders), scorpiones (scorpions), and cancri (crabs). The oniscus has 14, and the iuli and scolopendri still more.

The first joint of the leg, which is generally thickest, is called *femur*; the second, which is generally of the same size throughout, *tibia*; the third, which is jointed, is distinguished by the name of *tarsus*; and the

Claws, &c.
of insectsWings of
insects.

the last, which in most insects is double, by that of *unguis*. The legs of insects, in general, are named from the various motions they produce: *Cursorii*, from that of running, which are the most numerous; *saluatorii*, from that of leaping; *notatorii*, from that of swimming, &c.—In the *saluatorii*, the thighs are remarkably large, by which means they are able to leap to a considerable distance, as in the gryllus, grasshopper, &c. In those of the *Notatorii*, the feet are flat, and edged with hairs, which answer the purpose of oars in assisting them to swim, as in the dytiscus.—*Mutici*, are such feet as have no claws.—*Chele*, or claws, are the fore-feet enlarged towards their extremities, each of which is furnished with two lesser claws, which act like a thumb and finger; as in the crab.

Alæ, *Wings*, the instruments which enable the to fly. These are membranous and undivided, except in the instance of the phalænna alucitæ, in which they are in part divided. Most insects have four; the diptera-class, and the coccus, however, have two only.

The wing is divided into its superior and inferior surfaces: its anterior part in a butterfly, is that towards the anterior margin, or next to the head; its posterior part, that towards the anus; its exterior part, that towards the outer edge; and the interior, that next the abdomen.

They are called *plicatiles*, when they are folded at the time the insect is at rest, as in the wasp; opposite to these are the *planæ*, which are incapable of being folded.

Erethæ, such as have their superior surfaces brought in contact when the insect is at rest; as in the ephemera, libellula puella and virgo, and papilionæ (butterflies.)

Patentes, which remain horizontally extended when the insect is at rest; as in the phalænna geometræ, and most of the libellulæ.

Incumbentes, such as cover horizontally the superior part of the abdomen when the insect is at rest.

Flexæ, are incumbents, but not horizontally, the outer edges declining toward the sides.

Reverse, are flexæ, with this addition, that the edge of the inferior wings projects from under the anterior part of the superior ones.

Dentatæ, in which the edge is serrated, or scolloped.

Caudatæ, in which one or more projections in the hinder wings are extended into processes.

Reticulatæ, when the vessels of the wings put on the appearance of network, as in the hemerobius perla; the two anterior wings generally become superior, and the posterior ones inferior, in moths, when their wings are closed; but the anterior wings are called *primary*, and the inferior ones *secondary*, in butterflies, as they cannot with propriety be called *inferior* when the wings are erect.

Colores, the colours, these are self-apparent: but according to their several shapes, they take the different names of *puncta*, dots; *macule*, spots; *fasciæ*, bands, which frequently run across and sometimes surround the edge of the wings; *strigæ*, streaks, which are very slender fasciæ; and *lineæ*, lines, which are longitudinally extended.

Ocellus, is a round spot, containing a lesser spot of a different colour in its centre.

Stigmata, another term lately introduced by Linnaeus, signifies the spot, or anastomosis, in the middle of the wing near the anterior margin; it is conspicuous in most of the hymenoptera and neuroptera, and even in the coleoptera. The single or double kidney-shaped spots situated in the same part of the anterior wings, and frequently occurring in the phalænna pagana, is distinguished likewise by the name of *stigma*.

Elytra (in the singular number elytron). The upper wings, which are of a hard substance, in some degree resembling leather, and which in most insects are of a very hard texture, but in others flexible, are called *elytra*; their superior surface is generally convex, their inferior one concave. When the insect flies, they are extended; and shut when it rests, closing together, and forming a longitudinal surface down the middle of the back, as in the coleoptera.

They are of various shapes. *Abbreviata*, when shorter than the abdomen. *Truncata*, when shorter than the abdomen, and terminating in a transverse line. *Foligiata*, when of equal or greater length than the abdomen, and terminating in a transverse line. *Serrata*, when the exterior margin towards the apex is notched or serrated, as in some of the buprestes. *Spinosa*, when their surface is covered with sharp points or prickles. *Scabra*, when their surface is so uneven as to grate against the fingers. *Striata*, when marked with slender longitudinal furrows. *Porcata*, when with elevated longitudinal sulci or ridges. *Sulcata*, when these ridges are concave. *Hemelytra*, when the superior wings are of a middle substance betwixt leather and membrane; either totally so, as in the grylli; or partially so, as in the cimices, nepæ, and notonectæ: These are commonly distinguished by the name *hemiptera*.

Halteræ, poisers, (a term also introduced by Linnaeus), are little heads placed on a stalk or peduncle, most frequently under a little arched scale. They are found only in the class diptera, and appear to be nothing more than the rudiments of the hinder wings.

Cauda, the Tail, in most insects is, *Simplex*, simple, capable of being extended, and again drawn back at pleasure. In the crab and scorpion, however, it is

Elongata, elongated, or lengthened out. *Setacea*, bristle-shaped, or taper; as in the raphidea. *Trisetæ*, consisting of three bristles; as in the ephemera.

Furcata, being forked, as in the podura. *Forcipata*, resembling a pair of forceps; as in the forficula.

Foliosa, resembling a leaf; as in the blatta, grylli, and some species of cancri.

Telifera, such as are armed with a dart or sting; as in the scorpion and panora.

Aculeus, an instrument with which they wound, and at the same time instil a poison; with such the bee, wasp, scorpion, &c. are furnished.

EXPLANATION OF PLATE CLXXXII.

Fig. I. ANTENNÆ PECTINATÆ, or feathered; as in the *phalænna*, moths.

2. ANT.

2. ANTENNÆ PERFORIATÆ, or perforated; as in the *dermestes* and *dytiscus*.
3. ——— FISSILES, or fissile, divided into laminae at the extremity, as in the *scarabæi*, beetles.
4. ——— CLAVATÆ, or club-shaped, as in the *papilio*, butterfly.
5. ——— MONILIFORMES, like a necklace of beads; as in the *chrysomela*.
6. ——— SETACEÆ, setaceous, or bristle shaped; as in many of the *phalæna*.
7. ——— ARISTATÆ, furnished with a lateral hair, as in the *fly*.
8. *g* a Caput, the head.
b Palpi, or feelers.
c Antennæ, or horns.
d Oculi, the eyes.
e Thorax.
f Scutellum, or escutcheon.
g Pectus, or breast.
h Sternum, or breast-bone.
i Abdomen, and its segments.
k Anus.
l Elytra, or shells.
m Membranous wings.
n Pedes, or feet, which are natatorii.
10. *a* Femur, or thigh.
p Tibia, or leg.
q Tarsus, or foot.
r Unguis, or claw.
11. *a* The anterior part of the wing.
b The posterior part.
c The exterior part.
d The interior part.
e The margin.
f The disk, or middle.
g Oculus, or eye.
- 12, 13, 14, 15, Represent the insect in its egg, caterpillar, pupa, and perfect state.

SECT. II. Of the Sexes of Insects.

THE same difference of sex exists in insects as in other animals, and they even appear more disposed to increase their species than other animals; many of them, when become perfect, seeming to be created for no other purpose but to propagate their species. Thus the silk-worm, when it arrives at its perfect or moth-state, is incapable of eating, and can hardly fly: it endeavours only to propagate its species; after which the male immediately dies, and the female as soon as she has deposited her eggs.

In many insects, the male and female are with difficulty distinguished; and in some they differ so widely, that an unskilful person might easily take the male and female of the same insect for different species; as for instance, in the *phalæna humuli*, *pinaria*, *russula*; each sex of which differs in colour. This unlikeness is still more apparent in some insects, in which the male has wings and the female none; as in the coccus, *lampyris*, *phalæna antiqua*, *brumata*, *lichenella*. And as most insects remain a long while in copulation, as we may see in the tipula and silk-worm, the winged males fly with the wingless females, and carry them about from one place to another; as in the *phalæna an-*

tiqua. It is, however, no certain rule, that when one insect of the same species is found to have wings, and the other to be without, the former must necessarily be the male, and the latter the female. The aphides, for instance, are an exception; and besides these, individuals of both sexes, and of the same species, are found without wings, as the carabi majores, tenebriones, meloes, cimices. The gryllus pedestris is likewise destitute of wings; and might have passed for a gryllus in its pupa state, had it not been seen in copulation; for it is well known that no insect can propagate its species till it arrives at its last or perfect state.

"Pleraque insectorum genitalia sua intra annum habent abscondita, et penes solitarios, sed nonnulla penem habent bifidum: Cancris autem et Aranei geminos, quemadmodum nonnulla amphibia, et quod mirandum in loco alieno, ut Cancer, sub basi caudæ. *Araneus* mas palpos habet clavatos, qui penes sunt, juxta os utrinque unicum, quæ clavæ sexum nec speciem distinguunt; et femina vulvas suas habet in abdomine juxta pectus. Hic vero si unquam vere dixeris, "*Res plena timoris amor*: si enim proculus in auspicio accesserit, femina ipsum devorat; quod etiam fit, si non statim se retraxerit. Libellula femina genitale suum sub apice gerit caudæ, et mas sub pectore; adeo ut cum mas collum femine forcipe caudæ arripit, illa caudam sub pectore ejus adplicit, sicque peculiari ratione connexæ volitent."

Besides those of the male and female, a third sex exists in some insects which we call *neuter*: As these have not the distinguishing parts of either sex, they may be considered as eunuchs or infertile.

We know of no instance of this kind in any other class of animals, nor in vegetables, except in the class Syngenesia, and in the Opulus. This kind of sex is only found among those insects which form themselves into societies, as bees, wasps, and ants: and here these kind of eunuchs are real slaves, as on them lies the whole business of the economy; while those of the other sex are idle, only employing themselves in the increase of the family. Each family of *Bees* has one female only (called the *queen*), many males, and an almost innumerable quantity of neuters. Of those, the neuters (whose antennæ have 11 joints) do the working part; they extract and collect honey and wax, build up the cells, keep watch, and do a variety of other things. The males, whose antennæ consist of 15 joints, do no work; they serve the female once, and that at the expense of their lives; they may be considered in the light of a set of parasites, or cecisei; but as soon as their business of impregnation is over, they are expelled by their servants the neuters, who now shake off the yoke, but yet pay all due respect to their common mother the queen. The same economy nearly takes place in *Wasps*, where the young females, which are impregnated in the autumn, live through the winter, and in the spring propagate their species; but the queen, together with all the males, perish in the winter. Among *Ants*, the neuters form a hill in the shape of a cone, that the water may run off it, and place those which are in the pupa state on that side of it which is least exposed to the heat of the sun. At a considerable distance from these are found the habitations of the males and females, to whom the most ready obedience is yielded by the neuters, till a new offspring suc-

SECT. III.

Changes of
Insects.

of succeeds, and then they oblige them to quit their habitations. But those aptis which live entirely underground, provide better for themselves in this respect: for a little before their nuptials, they quit their habitation of their own accord, and after swarming in the manner of bees, they copulate in the air; and each requiring to some new habitation, founds a new family.

No *hermaphrodites* have as yet been discovered among insects. There is something very singular, however, in the propagation of the aphides. A female aphid once impregnated, can produce young, which will continue to produce others without any fresh impregnation, even to the fifth progeny; afterwards a new impregnation must take place. See APHIS.

The male insects, like male hawks, are always smaller than the females.

In the propagation of their species they are remarkably careful; so that it is with the greatest difficulty the flies are kept from depositing their eggs on fresh meat, the cabbage butterfly from laying them on cabbage, and other insects from depositing them in the several places peculiar to each. The scarabeus pilularius and carnifex, are deserving of our attention, as they afford a mutual assistance to each other: for when the female has laid her eggs in a little ball of dung, the males with their feet, which are axiform, assist the female to roll it to some suitable place; as Aristotle and Pliny formerly, and Loeßing has lately, observed.

It is very wonderful to observe, that in the coccus and oniscus, the female has no sooner brought forth her young, than she is devoured by it; and that the sphex should be able so readily to kill the caterpillar of a moth, then bury it in the earth, and there deposit her eggs in it. Nor can we without admiration behold the same species of aphid, which was viviparous in the summer, become oviparous in the autumn.

Almost innumerable examples might be brought of the singularities in the eggs of insects: we shall, however, only mention those of the *hemerobius*, which are deposited on a footstalk; those of the *phalena neustria*, which are placed regularly in a ring round the branch of some tree; and the compound eggs of the *blatta*.

SECT. III. *Metamorphoses of Insects.*

THERE are no insects, except those of the aptera class, but what are continually undergoing some transformation. Insects change first from the (ovum) egg, into the (larva) caterpillar or maggot; then into the (pupa) chrysalis; and lastly into the (imago) fly or perfect state. During each of those changes, their appearance differs as much as night and day.

The insect, as soon as it came out of the egg, was by former entomologists called *eruca*; but as this is synonymous with the botanic name *ssymbrium*, it was changed by Linnæus for the term

Larva; a name expressive of the insect's being, in this state, as it were masked, having its true appearance concealed. Under this mask or skin the entire insect, such as it afterwards appears when perfect, lies concealed, enveloped only in its tender wings, and putting on a soft and pulpy appearance; inasmuch that Swammerdam was able to demonstrate the butterfly with its wings to exist in a caterpillar,

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though it bore but a faint resemblance to its future perfection. The insect, therefore, in this state, undergoes no other alteration but the change of its skin. The larvæ are, for the most part, larger than the insect, when perfect, and are very voracious. The caterpillar of the cabbage-butterfly eats double what it would seem to require from its size; but its growth is not adequate to its voracity.

Pupa. The insect in this state was formerly called *chrysalis*, or *aurelia*: but as the appearance of gilding is confined to a few butterflies only, the term of *pupa* has been adopted in its stead; because the lepidoptera, especially, resemble an infant in swaddling clothes; and in this state all, except those of the hemiptera class, take no nourishment.

Imago, is the third state. This name is given by Linnæus to this third change, in which the insect appears in its proper shape and colours; and as it undergoes no more transformations, it is called *perfect*. In this state it flies, is capable of propagating its species, and receives true antennæ; which before, in most insects, were scarce apparent.

As the shape of the pupa is different in different classes of insects, it assumes different names; thus it is called

Coccardata, when it is round, and as it were turned, without the least resemblance of the structure of the insect; as in the diptera.

Obtecta, when it consists as it were of two parts, one of which surrounds the head and thorax, and the other the abdomen.

Incompleta, when they have wings and feet, but are not capable of moving them; as in most of the hymenoptera.

Semicompleta, in which they walk or run, but have only the rudiments of wings.

Completa, in which they immediately obtain the perfect form of the insect, without undergoing any more change: as in those of the aptera class, except only the flea. The bed-bug also belongs to this class.

The spider undergoes frequent transformations, though only in the colour of its skin. The crustaceous insects, as crabs, lobsters, &c. yearly cast their shells, as their growth would otherwise be impeded.

The scolopendri, when young, have fewer feet than when they are full grown.

All insects, as soon as they undergo the third change, are arrived at their full growth; nor do we find any difference in the size of the same species of insect in the same countries, unless, during its caterpillar state, it has not had a sufficiency of proper food.

SECT. IV. *Classification of Insects.*

As insects are endowed with the various powers of creeping, flying, and swimming, there is scarce any place, however remote and obscure, in which they are not to be found. The great confusion which appeared to the ancients to arise from their number, made them never dream of reducing them to any system. Swammerdam, that indefatigable inquirer into nature, observed that their metamorphoses were divided by nature into several states or orders. Their external appearance also carried with it some mark of distinction: so that entomologists called all those of the coleoptera

4 R

class

Classification of Insects.

class *Scarabei* (beetles); those of the lepidoptera *Papiliones*; and those of the gymnoptera class that had two wings only, *Musce* (flies); those of the same class that had four wings, were called *Apes* (bees). No farther progress was made in the systematic part of this science till the time of Linnaeus. He was the first that undertook to determine the genera, and assign them their proper characters, in the *Système Naturel*; and thus reduced this science to a systematic form. This system, in subsequent editions, was considerably enriched and amended by him, inasmuch that the science of insects now shines forth in its full lustre. He it was who first instituted natural orders, and reduced them into genera by expressive names; determined an infinite number of species in the *Fauna Suecica* and *Museum Reginae*; collected with incredible pains the synonymous names of the various authors who had written on them; and lastly, added their descriptions, and the places in which they were to be found. So that the system of this illustrious author will lead any person, without the assistance of a master, for the most part, easily to ascertain the name of any insect he may meet with. Before his time scarce any more than 200 insects were known; whereas, in the last edition of his system, he has determined the names of nearly 3000 distinct species: though this is not the sixth part of the number that is now known.

ORDERS. The class of insects is divided by Linnaeus into seven orders.

Plate CLXXXII.

1. The *Coleoptera* (from *κοιτης* a sheath, and *πτερον* a wing), are such insects as have crustaceous elytra or shells, which shut together, and form a longitudinal suture down the back of the insect; as the beetle (*butyrus* *ignita*), fig. 16.

2. *Hemiptera* (from *ημισ* half, and *πτερον* a wing), have their upper wings usually half crustaceous and half membranaceous, not divided by a longitudinal future, but incumbent on each other; as the cimex, fig. 17.

3. *Lepidoptera* (from *λεπιδ* a scale, and *πτερον* a wing), are insects having four wings, covered with fine scales in the form of powder or meal; as in the butterfly (*papilio antiopa*), fig. 18.

4. *Neuroptera*, from *νευρον* a nerve, and *πτερον* a wing, have four membranous transparent naked wings, generally like network; as in the *panorpa coa*, fig. 19.

5. *Hymenoptera* (from *υμεν* a membrane, and *πτερον* a wing), are insects with four membranous wings, tail furnished with a sting; as in the *tentredo*, fig. 20.

6. *Diptera* (from *δω* two, and *πτερον* a wing), are such as have only two wings, and poisters; as in the fly (*musca*), fig. 21.

7. *Aptera* (from *α* without, and *πτερον* a wing), insects having no wings. This last division contains scorpions, spiders, crabs, lobsters, &c. See ARANEA, CANCER, &c.

GENERA. To insert here the characters of all the different genera which may be found in Linnaeus's Syst. Nat. would be unnecessary. It will be sufficient to enumerate some new genera mentioned by subsequent systematic writers, that, by being acquainted with the subtle distinctions on which they are built, the student may avoid running into confusion. It is among the moderns only that genera of this kind are to be met with, and new names given them. To remove this difficulty, we shall first enumerate the names

of those authors which are synonymous with those of Linnaeus.

New GENERA of authors synonymous with those of Linnaeus.

Linnaeus's Names.	Names of other Authors.
Lucanus	Platyceros
Hiliter	Attilabus
Byrrhus	Anthrenus cistela
Myllabris	Laria Scop.
Atteclabus	Clerus
Silpha	Pelid
Bruchus	Myllabris
Ptinus	Byrrhus
Chrysomela	Galericula
Hilpa	Criofieris
Cantharis	Cicindela
Buprestis	Cucujus
Carabus	Buprestis
Myrmecoleon	Formica-leo.
Sirex	Uroceros.

New genera of authors.

Copris. *Scarabeus* abique scutello
Bistricius. *Dermestes* caepinus
Cistela. *Byrrhus* pilula
Rhinomancer. *Atteclabus* rostro producto fere cuculionis.

Anthribus. *Silpha*
Bruchus. *Ptinus* Fur ob spinas thoracis
Melolontha. *Chrysomela* cylindrica
Alica. — saltatoria
Diaperis. — fungorum
Pyrochora. *Cantharis*
Telephorus. *Cantharis*
Cantharis. *Meloe* alata
Cerocoma. *Meloe* shafferi
Notaxis. *Meloe* monoceros
Prionus. *Cerambyx* thoracis margine denticulato
Stenocoris. *Leptura* thorace spinosa
Hydrophilus. *Dytiscus* antennis clavatis
Myllabris. *Necydalis* minor
Acridium. *Gryllus* muticus
Locusta. — tettigonia
Tettigonia. *Cicada*
Corixa. *Notonecta*
Naucacris. *Nepa*
Perla. *Hemerobius* cauda bifida
Libelluloides. *Myrmecoleon* antennis capitatis
Crabro. *Tentredo* antennis clavatis
Pterophorus. *Phalena* alucita
Bibio. *Tipula* thorace spinoso
Stomoxoides. *Aphis* bucca inflata
Stratonymus. *Musca*
Nemotelus. *Musca*
Polucella. *Musca*.

These genera appear to be in a great measure like those which were introduced into botany by the followers of Rivinus. Paying too little regard to nature, they disunited natural genera, on account of the most trifling distinctions. This made their continuance in the science of very short duration; our business here is not to suppose, but to examine, what nature will allow of, and what she will not. Knowledge of this kind, built on opinion only, will not stand. We are therefore to look into the science with great accuracy; and the larva of the insect, its manner of changing, and other

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other things of moment, are to be known, before we presume to form a new genus.

Coining of new names, and changing of one old one for another, has been the source of the greatest confusion. Thus, in order to reduce the cicindela and carabus to the same genus, *buprestis* has been adopted for the generic name; but as that genus had long ago received a very different application, it was changed for that of *cucujus*.

Again, that the official cantharides might be ranged among the cerambyces, the cantharides have been removed from the genus of meloe (to which they naturally belong), and referred to the genus of cicindela, obtaining thus a new name. And so of many others.

Thus also, to mention no more, how needless and rash was it to separate the acridium and locusta from the genus of gryllus, the crabro from the tenthredines, and the mylabris from the necydalis!

TRIVIAL NAMES. The trivial names placed under their respective genera will occasion little or no controversy; they are current like money, and of the same utility as the proper names of men, Peter or Paul, &c. Insects living on vegetables should receive their names from the particular plants on which they mostly feed, as they are preferable to all others. Thus the names of the *phalana mori*, &c. are excellent; and when we are able to give such to insects, the old ones are to be discarded. But we are to be cautious of not being too hasty in our judgment in this respect; as insects, when they cannot get their favourite food, will often eat other plants. Thus the silk-worm, for want of mulberry leaves, will eat those of lettuce, though it will not thrive so well on them.

Many other instances of the invention of trivial names will be met with in the *Système Naturel*, particularly among the butterflies and moths. To prevent confusion from the great number of species which constitute the genus of phalana, they are distributed into sections, and distinguished by the terms of *bombyces*, *noctue*, *geometra*, *tortrices*, *pyralides*, *tinea*, and *alucita*. The bombyces and noctue, which are so much alike, that the females of the bombyces are with great difficulty distinguished from the noctue, are named promiscuously.

All those of the geometrae have their names terminating in *aria* and *ata*, according as their antennae are setaceous or pectinated. The tortrices, in *aria*; the pyralides, in *alis*; the tinea, in *ella*; and the alucite, in *dactyla*: so that it is evident from the termination itself to what section the insect is to be referred.

It were to be wished that similar institutions could

be formed throughout the whole science, as here the classification of insects.

Butterflies are divided into sections, by the names of *Equites*, *Heliconii*, *Danai*, *Nymphales*, and *Plebeii*.

In such a multitude of butterflies, the greatest part of which are foreign and extra European, and to whose food and manner of life we are utter strangers, it was impossible to give significant trivial names. Linnæus, therefore, by way of simile, has taken the names of the *Equites* from the Trojan history. These consist, as it were, of two troops or bodies; of which one contains the sables, and as it were mourning nobles, having red or bloody spots at the basis of their wings. These receive names from the Trojan nobles; and as Priam was king of Troy, the most splendid among these bear his name. The other body, ornamented with a variety of gay colours, are distinguished by the names of the Grecian heroes; and as in both armies there were kings as well as officers of an inferior rank, those elegant butterflies, whose hinder wings resembled tails, were distinguished by some royal name. Thus when Paris is mentioned (knowing from history that he was a Trojan, and of royal blood), we find him among those of the first section; that is, those of a sable colour, spotted in the breast with red, and having their hinder-wings resembling tails. When Agamemnon is named, we remember him to be a noble Greek, and find him among those nobles which have variegated and swallow-tailed wings. But when Ne-reus is spoken of, we readily know him to belong to the last section, with wings having no tails.

The second class, which contains the *Heliconii*, derive their names from the muses, as Urania. The names of the sons and daughters of Danaus are bestowed on the third section. And as these species are subdivided into two other sections, viz. the white and parti-coloured, the metaphor is so conducted, that the white ones preserve the names of the daughters of Danaus, and the parti-coloured ones those of the sons of Egyptus: so that it is evident from the name itself to what section the butterfly is to be referred.

The names of the fourth section, *Nymphales*, are taken from various nymphs of antiquity; and those of the fifth section, *Plebeii*, are selected from different men among the ancients whose names are worthy of remembrance: so that by this means a knowledge of the ancients may be interperfed, and this agreeable science be made doubly pleasing.

Those, therefore, who shall find new lepidoptera, and give them new names, will do well to follow this method, unless it be apparent what food the insect chiefly subsists on.

Entre-pas, a running.

E N T

ENTREPAS, in the manege, a broken pace or going, that is neither walk nor trot, but has somewhat of an amble.

This is a pace or gait of such horses as have no reins or back, and go upon their shoulders; or, of such as are spoiled in their limbs.

ENTRING-LADDERS, in a ship, are of two sorts; one used by the vessel's sides, in a harbour, or in fair weather, for persons to go in and out of the ship: the other is made of ropes, with small flaves for steps; and

E N T

is hung out of the gallery to enter into the boat, or to *Entrench*, come aboard the ship, when the sea runs so high that they durst not bring the boat to the ship's side for fear of flaving it.

ENTROCHUS, in natural history, a genus of extraneous fossils, usually of about an inch in length, and made up of a number of round joints, which, when separate and loose, are called *trochite*: they are composed of the same kind of plated spar with the fossil shells of the echini, which is usually of a bluish-grey colour.

Entry
Envoy.

and very bright where fresh-broken; they are all striated from the centre to the circumference, and have a cavity in the middle. See Plate CLXXXII.

The entrochi are found of all sizes, from that of a pin's head to a finger's length, and the thickness of one's middle finger; and are plainly of marine origin, having often sea-shells adhering to them. They seem to be the petrified arms of that singular species of the sea star-fish, called *Stella arboræscens*.

They are esteemed very powerful diuretics, and prescribed in nephritic cases with good success; the dose being as much of the powder as will lie on a shilling.

ENTRY, in law, signifies taking possession of lands or tenements, where a person has a right to do.

ENTRY of an Heir, in Scots law, that form of law by which an heir vests in himself a proper title to his predecessor's estate.

Bill of ENTRY, in commerce. See BILL.

In making entries inwards, it is usual for merchants to include all the goods they have on board the same ship in one bill, though sometimes they may happen to be upwards of 20 several kinds: and in case the goods are short entered, additional or post entries are now allowed; though formerly the goods, so entered, were forfeited. As to bills of entry outwards, or including goods to be exported, upon delivering them, and paying the customs, you will receive a small piece of parchment called a *cocket*, which testifies your payment thereof, and all duties for such goods.

If several sorts of goods are exported at once, of which some are free, and others pay customs; the exporter must have two cockets, and therefore must make two entries; one for the goods that pay, and the other for the goods that do not pay custom.

Entries of goods, on which a drawback is allowed, must likewise contain the name of the ship in which the goods were imported, the importer's name, and time of entry inwards. The entry being thus made, and an oath taken that the customs for those goods were paid as the law directs, you must carry it to the collector and comptroller, or their deputies; who, after examining their books, will grant warrant, which must be given to the surveyor, searcher, or land-waiter, for them to certify the quantity of goods; after which the certificate must be brought back to the collector and comptroller, or their deputies, and oath made that the said goods are really shipped, and not landed again in any part of Great Britain.

ENVELOPE, in fortification, a work of earth, sometimes in form of a simple parapet, and at others like a small rampart with a parapet: it is raised sometimes on the ditch, and sometimes beyond it.

ENVIRONNÉE, in heraldry, signifies surrounded with other things: thus, they say, a lion environné with so many bezants. See BEZANT.

ENUMERATION, an account of several things, in which mention is made of every particular article.

ENUMERATION, in rhetoric, a part of peroration; in which the orator, collecting the scattered heads of what has been delivered throughout the whole, makes a brief and artful relation or recapitulation thereof.

ENVOY, a person deputed to negotiate some affair with any foreign prince or state. Those sent from the courts of Britain, France, Spain, &c. to any petty prince or state, such as the princes of Germany, the

republics of Venice, Genoa, &c. go in quality of envoys, not ambassadors; and such a character only do those persons bear, who go from any of the principal courts of Europe to another, when the affair they go upon is not very solemn or important. There are envoys ordinary and extraordinary, as well as ambassadors; they are equally under the protection of the law of nations, and enjoy all the privileges of ambassadors; only differing from them in this, that the same ceremonies are not performed to them.

ENVY, in ethics; pain felt, and malignity conceived, at the sight of excellence or happiness in another. See EMULATION.

EON, or ÆON. See ÆON.

EONIAN, in church history, the followers of Eon, a wild fanatic of the province of Bretagne, in the 12th century, whose brain was disordered. He concluded from the resemblance between *eum*, in the form for exercising malignant spirits, viz. *Per eum, qui venturus est judicare vivos & mortuos*, and his own name Eon, that he was the son of God, and ordained to judge the quick and dead. Eon, however, was solemnly condemned by the council at Rheims in 1148, at which Pope Eugenius III. presided, and ended his days in a miserable prison. He left behind him a number of followers and adherents, whom persecution and death so weakly and cruelly employed, could not persuade to abandon his cause, or to renounce an absurdity which, says Mosheim, one would think could never have gained credit but in such a place as Bedlam.

EORIA, in mythology, a feast celebrated by the Athenians in honour of Erigonus, who, by way of punishment, for their not avenging the death of his father Icarus, engaged the gods to inflict the curse on their daughters, that they should love men who never returned their passion. The feast was instituted by the order of Apollo.

EOSTRE, in mythology, a Saxon goddess to whom they sacrificed in the month of April, called the month of *Eofstra*; and thence the name *Easter*, which the Saxons retained after their conversion to Christianity, applying it to the festival celebrated in commemoration of our Saviour's resurrection.

EPACRIS, in botany: A genus of the monogynia order, belonging to the pentandria class of plants. The calyx is a five-parted perianthium; the corolla monopetalous and tubular; the stamina five very short filaments; the pericarpium a roundish, depressed, quinquelocular, quinquevalvar, gaping capsule; the seeds are numerous and very small.

EPACTS, in chronology, the excesses of the solar month above the lunar synodical month, and of the solar year above the lunar year of twelve synodical months; or of several solar months above as many synodical months, and several solar years above as many dozen of synodical months.

The epacts, then, are either *annual* or *menstrual*.

Menstrual epacts are the excesses of the civil or kalendar month above the lunar month. Suppose, e. g. it were new-moon on the first day of January; since the lunar month is 29 days 12h. 44' 3", and the month of January contains 31 days, the menstrual epact is 1 day 11h. 15' 57".

Annual epacts are the excesses of the solar year above the lunar. Hence, as the Julian solar year is 365 days 6h. and the Julian lunar year 354 days 8h.

Envy
Epacts.

Epaets,
Epaminon-
das.

48' 38", the annual epact will be 10 days 21 h. 11' 22"; that is, nearly 11 days. Consequently the epact of 2 years is 22 days; of 3 years, 33 days; or rather 3, since 30 days make an *embolismic* or intercalary month.

Thus the epact of 4 years is 14 days, and so of the rest; and thus, every 19th year, the epact becomes 30 or 0; consequently the 20th year the epact is 11 again; and so the cycle of epacts expires with the golden number, or lunar cycle of 19 years, and begins with the same, as in the following table:

Gold. Numb.	Epacts.	Gold. Numb.	Epacts.	Gold. Numb.	Epacts.
1	XI	7	XVII	13	XXIII
2	XXII	8	XXVIII	14	IV
3	III	9	IX	15	XV
4	XIV	10	XX	16	XXVI
5	XXV	11	I	17	VIII
6	VI	12	XII	18	XIX
				19	XXX

Again, as the new moons are the same, that is, as they fall on the same day every 19 years, so the difference between the lunar and solar years is the same every 19 years. And because the said difference is always to be added to the lunar year, in order to adjust or make it equal to the solar year; hence the said difference respectively belonging to each year of the moon's cycle is called the *epact of the said year*, that is, the number to be added to the said year, to make it equal to the solar year; the word being formed from the Greek *επακτος*, *inducto, intercalo*.

Upon this mutual respect between the cycle of the moon and the cycle of the epacts, is founded this rule for finding the Julian epact, belonging to any year of the moon's cycle. Multiply the year given of the moon's cycle into 11; and if the product be less than 30, it is the epact sought; if the product be greater than 30, divide it by 30, and the remainder of the dividend is the epact. For instance, I would know the epact for the year 1712, which is the third year of the moon's cycle. Wherefore 3 is the epact for 1712; for $11 \times 3 = 33$, and 33 being divided by 30, there is left 3 of the dividend for the epact. But the difference of the Julian and Gregorian years being equal to the excess of the solar above the lunar year, or 11 days, it happens that the Gregorian epact for one year is the same with the Julian epact for the preceding year.

EPAMINONDAS, a celebrated Theban, the son of Polymnus, and one of the greatest captains of antiquity. He learned philosophy and music under Lyfias, a Pythagorean philosopher; and was from his infancy inured to all the exercises of body and mind. He was learned, generous, well-skilled in war, brave, modest, and prudent; and had such a regard for truth, that he would not tell a falsehood even in jest. He served first under the Lacedemonians; saved the life of Pelopidas their chief, who received in a battle seven or eight wounds; and contracted a strict friendship with that general, which lasted till his death. At his persuasions, Pelopidas delivered the city of Thebes from the yoke of the Spartans, who had rendered themselves masters of Cadmea, which occasioned a bloody war between the two nations. Epaminondas was made general of the Thebans, on which he gained the cele-

brated battle of Leuctra, in which Cleombrotus, the Epimalepsis, valiant king of Sparta, was killed. He then ravaged the enemy's country, and caused the city of Messina to be rebuilt and peopled. At length, the command of the army was given to another, because Epaminondas had kept his troops in the field four months longer than he had been ordered by the people; but, instead of retiring in disgust, he now served as a common soldier, and distinguished himself by many brave actions, that the Thebans, ashamed of having deprived him of the command, restored him to his post, in order to carry the war into Thessaly, where his arms were always victorious. A war breaking out between the Elians and the inhabitants of Mantinea, the Thebans took the part of the former. Epaminondas then resolved to endeavour to surprize Sparta and Mantinea; but not succeeding, he gave the enemy battle, in which he received a mortal wound with a javelin, the bearded iron remaining in the wound. Knowing that it could not be drawn out without occasioning immediate death, he would not suffer it to be touched, but continued to give his orders: and on his being told, that the enemy were entirely defeated, "I have lived long enough (he cried), since I die without being conquered;" and at the same time he plucked the javelin from his wound, and expired, 363 B. C.

EPANALEPSIS. See ORATORY. n° 73.

EPANODOS. *Ibid.* n° 75.

EPANORTHOSIS. *Ibid.* n° 86.

EPARER, in the manege, signifies the flinging of a horse, or his jerking and striking with his hind-legs.

EPAULEMENT, in fortification, a work raised to cover sidewise, is either of earth, gabions, or fascines loaded with earth. The epaulements of the places of arms for the cavalry, at the entrance of the trenches, are generally of fascines mixed with earth.

EPAULETTES, are a kind of shoulder-knots chosen for the soldiers, which are to be of the colour of the facing, with a narrow yellow or white tape round it, and worked fringe: those for the officers are made of gold or silver lace, with a rich fringe; they are badges of distinction worn on one or both shoulders. Those of the dragoon-guards, horse, and dragoons, are worn on the left shoulder: the light dragoons, and officers of grenadiers, have one on each shoulder: those of the battalion wear one on the right shoulder only, which is to be made of embroidery or lace with a gold or silver fringe. Those of the royal regiment of artillery are to be gold and embroidery, with gold fringe on scarlet cloth, and worn on the right shoulder.

EPENTHESIS, in grammar, the interposition or insertion of a letter or syllable in the middle of a word; as *altitum*, for *alitum*; *relligio*, for *religio*; *induperator*, for *imperator*, &c.

EPEUS, of the line of Endymion, the inventor of the battering ram, an engine of great service in sieges to make a breach. He is thought to have built the Trojan horse, and to have founded the city Metapontum.

EPHA, or *ΕΦΑΗ*, in Jewish antiquity, a measure for things dry, equal to 3 pecks and 3 pints.

EPHEBAÛM, in antiquity, the place where the ephēbi or youth exercised; or, as some say, where those who

Ephebaum

Ephebi
||
Ephemera.

who designed to exercise met, and agreed what kind of exercise they should contend in, and what should be the victor's reward.

EPHEBI, among the Athenians, a designation given to their young men when they arrived at 18 years of age, at which time they had their names entered in a public register.

EPHEDRA, in botany, a genus of the monodelphia order, belonging to the diccæa class of plants; and in the natural method ranking under the 51st order, *Conifera*. The male calyx is bifid; there is no corolla, but seven stamina; four antheræ inferior; three superior. The female calyx is bipartite, and fivefold, one upon another; there is no corolla; there are two pistils, and two seeds covered by the calyx, resembling a berry.

EPHEMERA, from *ἡμερα*, "a day;" a diary fever, or a fever of one day's continuance only. In this case, such a heat attends an excess of wine, a pulse somewhat full and quick, but soft and regular, a slight headache, a nausea, and restlessness, are all the symptoms, and which terminate without any sensible evacuation. If it continue unto the third day, it is not a diary fever; and if the constitution is very dry, an hectic is to be dreaded.

EPHEMERA, the *Day-fly*, in zoology, a genus belonging to the order of neuroptera. It has no teeth or palpe; there are two large protuberances above the eyes; the wings are erect, the two hind ones being largest; and the tail is bristly. These flies, who take their name from the shortness of their life, are distinguished into several species. Some live several days, others do not take flight till the setting of the sun, and live not to see the rising of that luminary. Some exist but one hour, others but half that time; in which short period they comply with the call of nature. With respect to those who live several days, there is a peculiarity observed, incident to themselves alone. They have to cast off one slough more, an operation which sometimes takes 24 hours to complete. To bring this about, they cling fast to a tree. The ephemera, before they flutter in air, have in some manner been fishes. They remain in the states of larva and chrysalis for one, two, or three years. The chrysalis only differs from the larva by there being observable

Barbut's
Insects.

Plate
CLXXXII.

on its back cases for wings. Both have on their sides small fringes of hair, which, when put into motion, serve them as fins. Nothing can be more curious than the plying of those little oars in the water. Their abdomen is terminated, as well as in their state of flies, by three threads. These larvæ scoop themselves out dwellings in the banks of rivers; and they are small tubes made like siphons, the one serving for an entrance, the other affording them an outlet. The banks of some rivers are often perforated with them. When the waters decrease, they dig fresh holes lower down, in order to enjoy their element the water. The season and hour when the chrysalids of the different species of the ephemera turn into flies, maintain a kind of regularity. The heat, the rise or fall of the waters, accelerate, however, or postpone their final display. The ephemera of the Rhine appear in the air two hours before sunset. These flies are hatched almost all at the same instant in such numbers as to darken the air. The most early of those on the Marne and Seine in France do not begin to fly till two hours

Ephemera-
rides,
Ephefus.

after the setting of the sun, towards the middle of August. They are seen fluttering and sporting on the brink of their tomb. The glare of light attracts them, round which they perform a thousand circles with amazing regularity. Their coming together for the purpose of generation can only be furnished, the shortness of their life requiring that all its functions should be proportionable to their duration. Some naturalists have been of opinion, that the males impregnated the eggs after the manner of fishes. The females, by the help of the threads of their tail and the flapping of their wings, support themselves on the surface of the water, and in that almost upright situation drop their eggs in clusters. One single female will lay 700 or 800 eggs, which sink to the bottom. The larvæ that escape from the voraciousness of the fishes, fret about the construction of habitations to shelter them from every kind of danger. When the flies have propagated, they are seen to die and fall by heaps. The land and water are strewed with them to a considerable thickness. The fishermen consider these multitudes of destroyed insects as manna for the fishes.

EPHEMERIDES, in astronomy, tables calculated by astronomers, showing the present state of the heavens for every day at noon; that is, the places wherein all the planets are found at that time. It is from these tables that the eclipses, conjunctions, and aspects of the planets, are determined; horoscopes or celestial schemes constructed, &c. We have ephemerides of Origan, Kepler, Argoli, Heckerus, Mezaraarchis, Wing, De la Hire, Parker, &c. S. Cassini has calculated ephemerides of the sidera medicæ or satellites of Jupiter, which are of good use in determining the longitude.

In England, the Nautical Almanac, or Astronomical Ephemeris, published annually by anticipation, under the direction of the commissioners of longitude, is the most considerable. In France, celestial ephemerides have been published by M. Desplaces every ten years, from 1715 to 1745: they were afterwards continued by the Abbé Caille, with many additions; of which an account may be seen in the History of the Academy of Sciences for 1743. The Academy of Sciences have likewise published annually, from the beginning of the present century, a kind of ephemeris, under the title of *Connaissance des Temps*.

EPHEBUS, a city of antiquity, much celebrated on account of its temple of Diana, and for being the most famous mart or staple town of Hither Asia. Ephebus was in ancient times the metropolis of all Asia. Stephenus gives it the title of *Epiphaniastæ*, or *most illustrious*; and Pliny styles it the ornament of Asia. The ancient city stood about 50 miles south of Smyrna, near the mouth of the river Cayster, and the shore of the Icarian sea, which is a bay of the *Ægean*; but as it has been so often destroyed and rebuilt, it is no easy matter to determine the precise place. Most of our modern travellers are of opinion, that the ancient city stood more to the south than the present; which they argue from the ruins that still remain. Ephebus was, in ancient times, known by the names of *Aloper*, *Ortygia*, *Morges*, *Smyrna*, *Trachea*, *Samornion*, and *Pela*. It was called *Ephebus*, according to Heracles, from the Greek word *ephebus*, signifying *permissum*; because Hercules (says he) permitted the Amazons to live and build a city in that place. Others tell

Ephesus

us, that Ephesus was the name of the Amazon that founded the city; for Pliny, Justin, and Orosius, unanimously affirm that it was built by an Amazon; while others bestow this honour upon Androclus, the son of Codrus, king of Athens, who was the chief of the Ionians that settled in Asia. But in matters of so early a date, it is impossible to come at the truth, and therefore not worth our while to dwell on such fruitless inquiries. What we know for certain is, that the city, which in the Roman times was the metropolis of all Asia, acknowledged Lyfimachus for its founder; for that prince, having caused the ancient city to be entirely demolished, rebuilt, at a vast expence, a new one, in a place more convenient, and nearer the temple. Strabo tells us, that, as the inhabitants showed a great reluctance to quit their ancient habitations, Lyfimachus caused all the drains that conveyed the water into the neighbouring fens and the Cayster to be privately stopped up; whereby the city being on the first violent rains in great part laid under water, and many of the inhabitants drowned, they were glad to abandon the ancient and retire to the new city. This new Ephesus was greatly damaged by an earthquake in the reign of Tiberius, but by that emperor repaired and adorned with several stately buildings, of which there are now but few ruins to be seen, and scarce any thing worthy of ancient Ephesus. The aqueduct, part of which is still standing, is generally believed to have been the work of the Greek emperors; the pillars which support the arches are of fine marble, and higher or lower as the level of the water required. This aqueduct served to convey water into the city from the spring of Halitæe, mentioned by Pausanias. The gate, now called by the inhabitants, for what reason we know not, *the Gate of Persecutions*, is remarkable for three bas-reliefs on the mould of an exquisite taste. The port, of which so many medals have been struck, is at present but an open road, and not much frequented. The Cayster was formerly navigable, and afforded a safe place for ships to ride in, but is now almost choked up with sand.

But the chief ornament of Ephesus was the temple of Diana, built at the common charge of all the states in Asia, and for its structure, size, and furniture, accounted among the wonders of the world. This great edifice was situated at the foot of a mountain, and at the head of a marsh; which place they chose, if we believe Pliny, as the least subject to earthquakes. This site doubled the charges; for they were obliged to be at a vast expence in making drains to convey the water that came down the hill into the morafs and the Cayster. Philo Byzantium tells us, that in this work they used such a quantity of stone, as almost exhausted all the quarries in the country; and these drains or vaults are what the present inhabitants take for a labyrinth. To secure the foundations of the conduits or sewers, which were to bear a building of such a prodigious weight, they laid beds of charcoal, says Pliny, well rammed, and upon them others of wool. Two hundred and twenty years, Pliny says 400, were spent in building this wonderful temple by all Asia. It was 425 feet in length, and 200 in breadth, supported by 127 marble pillars, 70 feet high, of which 27 were most curiously carved, and the rest polished. These pillars were the works of so many kings, and the bas-

reliefs of one were done by Scopas, the most famous sculptor of antiquity; the altar was almost wholly the work of Praxiteles. Cheironomocates, who built the city of Alexandria, and offered to form Mount Athos into a statue of Alexander, was the architect employed on this occasion. The temple enjoyed the privilege of an asylum, which at first extended to a furlong, was afterwards enlarged by Mithridates to a bow-shot, and doubled by Marc Antony, so that it took in part of the city: but Tiberius, to put a stop to the many abuses and disorders that attend privileges of this kind, revoked them all, and declared that no man guilty of any wicked or dishonest action should escape justice, though he fled to the altar itself.

The priests who officiated in this temple were held in great esteem, and trusted with the care of sacred virgins, or priestesses, but not till they were made eunuchs. They were called *Ephiatæ* and *Ephæni*, had a particular diet, and were not allowed by their constitutions to go into any private house. They were maintained with the profits accruing from the lake Selinusius, and another that fell into it, which must have been very considerable, since they erected a golden statue to one Artemidorus, who being sent to Rome, recovered them after they had been seized by the farmers of the public revenues. All the Ionians resorted yearly to Ephesus, with their wives and children, where they solemnized the festival of Diana with great pomp and magnificence, making on that occasion rich offerings to the goddess, and valuable presents to her priests. The *asfiarchæ*, mentioned by St Luke, were, according to Beza, those priests whose peculiar province it was to regulate the public sports that were annually performed at Ephesus in honour of Diana: they were maintained with the collections made during the sports; for all Asia flocked to see them. The great Diana of the Ephesians, as she was styled by her blind adepts, was, according to Pliny, a small statue of ebony, made by one Canitia, though commonly believed to have been sent down from heaven by Jupiter. This statue was first placed in a nich, which, as we are told, the Amazons caused to be made in the trunk of an elm. Such was the first rise of the veneration that was paid to Diana in this place. In process of time the veneration for the goddess daily increasing among the inhabitants of Asia, a most stately and magnificent temple was built near the place where the elm stood, and the statue of the goddess placed in it. This was the first temple; but not quite so sumptuous as that which we have described, though reckoned, as well as the second, among the wonders of the world. The second, being that above described, was remaining in Pliny's time, and in Strabo's; and is supposed to have been destroyed in the reign of Constantine, pursuant to the edict by which that emperor commanded all the temples of the heathens to be thrown down and demolished: the former was burnt the same day that Alexander was born, by one Erosistratus, who owned on the rack, that the only thing which had prompted him to destroy so excellent a work, was the desire of transmitting his name to future ages. Whereupon the common council of Asia made a decree, forbidding any one to name him; but this prohibition served only to make his name more memorable, such a remarkable extravagance, or rather madness, being taken notice of by all the historians who.

Ephesus.

Ephesus. who have written of those times. Alexander offered to rebuild the temple at his own expence, provided the Ephesians would agree to put his name on the front; but they rejected his offer in such a manner as prevented the resentment of that vain prince, telling him, that "it was not fit one god should build a temple to another." The pillars, and other materials that had been faved out of the flames, were sold, and also the jewels of the Ephesian women, who on that occasion willingly parted with them; and the sum raised from thence served for the carrying on of the work till other contributions came in, which, in a short time, amounted to an immense treasure. This is the temple which Strabo, Pliny, and other Roman writers speak of. It stood between the city and the port, and was built, or rather finished, as Livy tells us, in the reign of king Servius. Of this wonderful structure there is nothing at present remaining but some ruins, and a few broken pillars.

The Ionians first settled at Ephesus under the conduct of Androclus, who drove out the Carians and Leleges, by whom those places were possessed at his arrival. The city, whither built by him, as Strabo affirms, or by one Crcesus or Ephefus, long before the Ionic migration, as others maintain, became soon the metropolis of Ionia. It was at first governed by Androclus, and his descendants, who assumed the royal title, and exercised the regal authority over the new colony: whence, even in Strabo's time, the posterity of Androclus were styled kings, and allowed to wear a scarlet robe, with a sceptre, and all the ensigns of the royal dignity. In process of time, a new form of government was introduced, and a senate established; but when, or on what occasion, this change happened, we know not. This kind of government continued till the time of Pythagoras, who lived before Cyrus the Great, and was one of the most cruel and inhuman tyrants we read of in history; for, having driven out the senate, and taken all the power into his own hands, he filled the city with blood and rapine, not sparing even those who fled to the temple of Diana for shelter. Pythagoras was succeeded by Pindarus, who bore the same sway in the city; but treated the citizens with more humanity. In his time Ephefus being besieged by Crcesus king of Lydia, he advised the inhabitants to devote their city to Diana, and fasten the wall, by a rope, to the pillars of her temple. They followed his advice, and were, from reverence to the goddess, not only treated with great kindness by Crcesus, but restored to their former liberty. Pindarus being obliged to resign his power, retired to Peloponnesus. He was, according to *Ælian*, grandson to Alyattes king of Lydia, and Crcesus's nephew. The other tyrants of Ephefus mentioned in history are, Athenagoras, Comas, Aristarchus, and Hegesias; of whom the last was expelled by Alexander, who, coming to Ephefus, after having defeated the Persians on the banks of the Granicus, bestowed upon Diana all the tributes which the Ephesians had paid to the Persians, and established a democracy in the city. In the war between Mithridates and the Romans, they sided with the former, and, by his direction, massacred all the Romans that resided in their city; for which barbarity they were severely fined, and reduced

almost to beggary by Sylla, but afterwards treated kindly, and suffered to live according to their own laws, as is plain from several ancient inscriptions and medals. The Ephesians were much addicted to superstition, forcery, and curious arts, as the scripture styles them; whence came the proverb "Ephesian letters," signifying all sorts of spells or charms.

In the time of the apostle Paul, Ephefus retained a great deal of its ancient grandeur. But it was a ruinous place, when the emperor Justinian filled Constantinople with its statues, and raised his church of St Sophia upon its columns. Since then it has been almost quite exhausted. Towards the end of the 11th century, a Turkish pirate, named *Tangrispermes*, settled there. But the Greek admiral, John Lucas, defeated him in a bloody battle, and pursued the flying Turks up the Mæander. In 1306, it was among the places which suffered from the exactions of the grand-duke Roger; and two years after, it surrendered to sultan Sayfan, who, to prevent future insurrections, removed most of the inhabitants to Tyrizum, where they were massacred. Ephefus appears to have subsisted as an inconsiderable place for some time. But now, the Ephesians are only a few Greek peasants, living in extreme wretchedness, dependence, and insensibility; the representatives of an illustrious people, and inhabiting the wreck of their greatness; some, the substructions of the glorious edifices which they raised; some, beneath the vaults of the Stadium, once the crowded scene of their diversions; and some, by the abrupt precipice, in the sepulchres which received their ashes.

EPHETÆ (from *ἐπειθε*, "I persuaded"), in antiquity, a sort of magistrates among the Athenians, instituted by king Demophoon, to take cognizance of murder, man-slaughter, and chance-medley.

Their number was 100, whereof 50 were Athenians, and 50 Argians: they were not admitted to the post till upwards of 50 years of age. Dracon new modelled it, excluded the Argians out of it, and made it to consist of 51 Athenians, each above 50 years of age: *Ubbø Emmius de Rep. Athen.* says, he transferred to them part of the jurisdiction of the *Areopagites*. See **AREOPAGUS**.

EPHOD, in Jewish antiquity, one part of the priestly habit; being a kind of girdle, which, brought from behind the neck over the two shoulders, and hanging down before, was put across the stomach, then carried round the waist, and made use of as a girdle to the tunic.—There were two sorts of ephods, one of plain linen for the priests, and the other embroidered for the high priest.

EPHORI, in Grecian antiquity, magistrates established in ancient Sparta to balance the regal power. The authority of the ephori was very great. They sometimes expelled and even put to death the kings, and abolished or suspended the power of the other magistrates, calling them to account at pleasure. There were five of them, others say nine. They presided in the public shows and festivals. They were entrusted with the public treasure; made war and peace; and were so absolute, that Aristotle makes their government equal to the prerogative of a monarchy. They were established by *Lycurgus*, according to the generality of authors: though this is denied by others, who date their

Epithorus
||
Epibaterium.

their origin 130 years after the time of that legislator. Thus Plutarch, in his Life of Cleomenes, ascribes their institution to Theopompus king of Sparta; which is also confirmed by the authority of Aristotle.

EPHORUS, an orator and historian of Cumæ in Æolia, about 352 years before Christ. He was disciple to Isocrates, by whose advice he wrote an history which gave an account of all the actions and battles that had happened between the Greeks and barbarians for 750 years. It was greatly esteemed by the ancients; but is now lost.

EPHRAIM (anc. geog.), one of the divisions of Palestine by tribes: Ephraim and the half tribe of Manasseh are blended together by the sacred writer; and it only appears that Ephraim occupied the more southern, and the half tribe of Manasseh the more northern parts, but both seem to have extended from the Jordan to the sea. Ephraim also denotes a kingdom, on the separation of the 10 tribes from the house of David, called also the kingdom of Israel and of Samaria.

EPHRATA, a small town of Pennsylvania in America, and the principal settlement of the religious sect called *Dunkards* or *Tunkers*. See *TUNKERS*.

EPHREM (Syrrus), an ancient Christian writer, in the fourth century, deacon of Edessa, was born at Nisibe, in Syria. He was greatly esteemed by St Basil, St Gregory, Nyssen, and other great men. He wrote against the opinions of Sabellius, Arius, Apollonarius, the Manichees, &c. and acquired such reputation by his virtue and his works, that he was called the *doctor and the prophet of the Syrians*. He died in 378. The best editions of his works are, that of Oxford, in 1708, in folio, and that of Rome, from 1732 to 1736, in Syriac, Greek, and Latin, 6 vols folio.

EPHYDOR, in antiquity, an officer in the Athenian courts of justice, who was to provide the plaintiff and defendant with equal water hour-glasses. When the glass was run out, they were not permitted to speak any farther; and, therefore, we find them very careful not to lose or mispend one drop of their water. Whilst the laws quoted by them were reciting, or if any other business happened to intervene, they gave orders that the glass should be stopped.

EPIBATÆ, *ἑπιβάται*, among the Greeks, marines or soldiers who served on board the ships of war. They were armed in the same manner as the land-forces, only that more of them wore full or heavy armour.

EPIBATERION, a poetical composition, in use among the ancient Greeks. When any person of condition and quality returned home after a long absence or journey into another country, he called together his friends and fellow-citizens, and made them a speech, or rehearsed them a copy of verses, wherein he returned solemn thanks to the immortal gods for his happy return; and ended with an address by way of compliment to his fellow-citizens.—These verses made what the Greeks call *ἐπιβατήριον*, *epibateryon*, of *ἐπιβαίνω*, "I go abroad". At going away they had another, called *αποβατήριον*.

EPIBATERIUM, in botany: A genus of the hexandria order, belonging to the monœcia class of plants. In the male flowers the calyx is a double

perianthium, the outward one with six leaves, very small; the inner one three-leaved, and three times larger than the former, with egg-shaped leaves. The corolla has six petals smaller than the interior calyx and roundish. The stamina are six capillary filaments, crooked, and as long as the petals; the antheræ are roundish. The female flowers are on the same plant. The calyx and corolla are as in the male. The pericarpium consists of three roundish, monospermous plums; the seed a kidney-shaped compressed nut, somewhat furrowed.

EPIC, or HEROIC, *Poem*, a poem expressed in narration, formed upon a story partly real and partly feigned; representing, in a sublime style, some signal and fortunate action, distinguished by a variety of great events, to form the morals, and affect the mind with the love of heroic virtue.

We may distinguish three parts of the definition, namely, the matter, the form, and the end. The matter includes the action of the fable, under which are ranged the incidents, episodes, characters, morals, and machinery. The form comprehends the way or manner of the narration, whether by the poet himself, or by any persons introduced, whose discourses are related: to this branch likewise belong the moving of the passions, the descriptions, discourses, sentiments, thoughts, style, and verification; and besides these, the families, tropes, figures, and, in short, all the ornaments and decorations of the poem. The end is to improve our morals and increase our virtue. See *POETRY*.

EPICEDION (formed of *ἐπὶ* upon, and *καθός* funeral), in the Greek and Latin poetry, a poem, or poetical composition, on the death of a person.—At the obsequies of any man of figure, there were three kinds of discourses usually made; that rehearsed at his *pyram* or funeral pile, was called *nenia*; that engraven on his tomb, *epitaphy*; and that spoken in the ceremony of his funeral, *epicedion*. We have two beautiful epicedions in Virgil, that of Euryalus and that of Pallas.

EPICEDIUM, in ancient poetry, a poem rehearsed during the funeral solemnity of persons of distinction.

EPICHRMUS, an ancient poet and philosopher, born in Sicily, was a scholar of Pythagoras. He is said to have introduced comedy at Syracuse in the reign of Hiero. Horace commends Plautus for imitating him, in following the chase of the intrigue so closely as not to give the readers or spectators time to trouble themselves with doubts concerning the discovery. He wrote likewise treatises concerning philosophy and medicine; but none of his works have been preserved. He died aged 90, according to Lactantius, who has preserved four verses inscribed on his statue.

EPICHIROTONIA, among the Athenians. It was ordained by Solon, that once every year the laws should be carefully revised and examined; and if any of them were found unsuitable to the present state of affairs, they should be repealed. This was called *ἐπιχιρῶν τὰ νόμους*, from the manner of giving their suffrages by holding up their hands. See a farther account of this custom in Pott. *Archæol. Græc.* lib. 1. cap. 26. tom. i. p. 142.

EPICOENE, in grammar, a term applied to nouns,

Epic
||
Epicoene.

Epicurus, which, under the same gender and termination, mark indifferently the male and female species. Such in Latin is *agula*, *vestertilo*, &c. which signify equally a male or female eagle or bat.

Grammarians distinguish between *epicane* and *common*. A noun is said to be common of two kinds, when it may be joined either with a masculine or a feminine article; and *epicane*, when it is always joined to some of the two articles, and yet signifies both genders.

EPICTE'US, a celebrated Stoic philosopher, born at Hierapolis in Phrygia, in the first century, was the slave of Epaphroditus, a freedman and one of Nero's guard. Domitian banishing all philosophers from Rome, about the year 94, Epictetus retired to Nicopolis in Epirus, where he died in a very advanced age; and after his death, the earthen lamp he made use of sold for 3000 drachmas. He was a man of great modesty; which was eminent in his own practice, as well as in his recommendation to others: hence he used to say, "That there is no need of adorning a man's house with rich hangings or paintings, since the most graceful furniture is temperance and modesty, which are lasting ornaments, and will never be the worse for wearing." Of all the ancient philosophers, he seems to have made the nearest approaches to the Christian morality, and to have had the most just ideas of God and providence. He always possessed a cool and serene mind, unruffled by passion; and was used to say, that the whole of moral philosophy was included in these words, *support and abstain*. One day, his master Epaphroditus strove in a frolic to wrench his leg; when Epictetus said, with a smile, and free from any emotion, "If you go on, you will certainly break my leg;" but the former redoubling his effort, and striking it with all his strength, he at last broke the bone; when all the return Epictetus made was, "Did not I tell you, Sir, that you would break my leg?" No man was more expert at reducing the rigour of the maxims of the Stoics into practice. He conformed himself strictly to both in his discourse and behaviour, to the manners of Socrates and Zeno. He waged continual war with fancy and fortune; and it is an excellence peculiar to himself, that he admitted all the severity of the Stoics without their sourness, and reformed Stoicism as well as professed it; and besides his vindicating the immortality of the soul as strenuously as Socrates or any Stoic of them all, he declared openly against self-murder, the lawfulness of which was maintained by the rest of the sect. Arrian, his disciple, wrote a large account of his life and death, which is lost; and preserved four books of his discourses and his Enchiridion, of which there have been several editions in Greek and Latin; and, in 1758, a translation of them into English was published by the learned and ingenious Miss Carter.

EPICUREAN PHILOSOPHY, the doctrine or system of philosophy maintained by Epicurus and his followers.

His philosophy consisted of three parts; canonical, physical, and ethereal. The first was about the canons or rules of judging. The censure which Tully passes upon him for his despising logic, will hold true only with regard to the logic of the Stoics, which he could not approve of, as being too full of nicety and quirk. Epicurus was not acquainted with the analytical method of division and argumentation, nor was he so curious in modes and formation as the Stoics. Soundness and

simplicity of sense, assisted with some natural reflection, was all his art. His search after truth proceeded only by the senses; to the evidence of which he gave so great a certainty, that he considered them as an infallible rule of truth, and termed them the *first natural light of mankind*.

In the second part of this philosophy he laid down atoms, space, and gravity, as the first principles of all things: he did not deny the existence of God, but thought it beneath his majesty to concern himself with human affairs; he held him a blessed immortal Being, having no affairs of his own to take care of, and above meddling with those of others.

As to his ethics, he made the supreme good of man to consist in pleasure, and consequently supreme evil in pain. Nature itself, says he, teaches us this truth; and prompts us from our birth to procure whatever gives us pleasure, and avoid what gives us pain. To this end he proposes a remedy against the sharpness of pain: this was to divert the mind from it, by turning our whole attention upon the pleasures we have formerly enjoyed. He held that the wise man must be happy, as long as he is wise: the pain, not depriving him of his wisdom, cannot deprive him of his happiness.

There is nothing that has a fairer show of honesty than the moral doctrine of Epicurus. Gassendus pretends, that the pleasure in which this philosopher has fixed the sovereign good, was nothing else but the highest tranquillity of mind, in conjunction with the most perfect health of body: but Tully, Horace, and Plutarch, as well as almost all the fathers of the church, give us a very different representation: indeed the nature of this pleasure, in which the chief happiness is supposed to be seated, is a grand problem in the morals of Epicurus. Hence there were two kinds of Epicureans, the rigid and the remiss: the first were those who understood Epicurus's notion of pleasure in the best sense, and placed all their happiness in the pure pleasures of the mind, resulting from the practice of virtue: the loose or remiss Epicureans, taking the words of that philosopher in a gross sense, placed all their happiness in bodily pleasures or debauchery.

EPICURUS, the greatest philosopher of his age, was born at Gargettium in Attica, about 340 B. C. in the 109th Olympiad. He settled at Athens in a fine garden he had bought; where he lived with his friends in great tranquillity, and educated a great number of disciples. They lived all in common with their master. The respect which his followers paid to his memory is admirable: his school was never divided, but his doctrine was followed as an oracle. His birth-day was still kept in Pliny's time; the month he was born in was observed as a continued festival; and they placed his picture every where. He wrote a great many books, and valued himself upon making no quotations. He raised the atomical system to a great reputation, though he was not the inventor of it, but had only made some change in that of Democritus. As to his doctrine concerning the supreme good or happiness, it was very liable to be misrepresented, and some ill effects proceeded from thence, which discredited his sect. He was charged with perverting the worship of the gods, and inciting men to debauchery; but he did not forget himself on this occasion: he published his opinions to the whole world; he wrote some books of devotion; recommended the veneration of the gods, so-

Epicycle
Epidaurus

briety, and chastity; and it is certain that he lived in an exemplary manner, and conformably to the rules of philosophical wisdom and frugality. Timocritus, a defender of his sect, spoke very scandalously of him. Galfendus has given us all he could collect from the ancients concerning the person and doctrine of this philosopher; who died of a suppression of urine, aged 72.

EPICYCLE, in the ancient astronomy, a little circle whose centre is in the circumference of a greater circle: or it is a small orb or sphere, which being fixed in the deferent of a planet, is carried along with it; and yet, by his own peculiar motion, carries the planet fastened to it round its proper centre.

It was by means of epicycles that Ptolemy and his followers solved the various phenomena of the planets, but more especially their stations and retrogradations.

EPICYCLOID, in geometry, a curve generated by the revolution of the periphery of a circle, along the convex or concave side of the periphery of another circle.

EPICYEMA, among physicians, denotes a suppletion; being a false conception or mole happening after the birth of a regular fetus.

EPIDAUURUM, EPIDAUROS, or EPITAUURUM, (anc. geog.), a town of Dalmatia, on the Adriatic, built the same year, as is said, by Dyrrachium, 430 years after the destruction of Troy: A considerable town formerly, but now reduced to a small village, called *Ragusi Vecchio*; distant six miles from the modern Ragusi. E. Long. 19°. Lat. 42°, 20'.

EPIDAUROS (anc. geog.), a town of Argolis, in Peloponnesus, on the Saronic bay, to the south of the promontory *Spireum*; called *sacred*, because of the religious veneration paid to Æsculapius, whose temple stood at the distance of five miles from the town. The Romans, during a pestilence, being advised to convey the god to Rome, sent a ship, with a solemn embassy, for his conveyance: but while the Epidaurians were in suspense to part with him, a huge serpent failed to the ship; and, being taken for the god, was carried to Rome in great solemnity. Epidaurus stood in a recess of the bay, fronting the east; and was fortified by nature, being inclosed by high mountains reaching to the sea, and rendering it difficult of access. It had several temples, and in the acropolis or citadel was a remarkable statue of Minerva. The site is now called *Epi-thaero*. The traces are indistinct, and it has probably been long deserted. The harbour of Epidaurus is long. Its periphus or circuit was 15 stadia or near two miles. The entrance is between mountains, and on a small rocky peninsula on the left hand are ruins of a modern fortress. This, it seems, was the point on which a temple of Juno stood. It is frequented by vessels for wood or corn. The grove of Æsculapius was inclosed by mountains, within which all the sacrifices as well of the Epidaurians as of strangers were consumed. One was called Tithion; and on this the god when an infant was said to have been exposed, and to have been suckled by a she-goat. He was a great physician, and his temple was always crowded with sick persons. Beyond it was the dormitory of the suppliants; and near it, a circular edifice called the *Tholos*, built by Polycletus, of white marble, worth seeing. The grove, besides other temples, was adorned

with a portico, and a fountain remarkable for its roof and decorations. The bath of Æsculapius was one of the benefactions of Antoninus Pius, while a Roman senator; as was also a house for the reception of pregnant women and dying persons, who before were removed out of the inclosure, to be delivered or to expire in the open air. The remains are heaps of stones, pieces of brick wall, and scattered fragments of marble; besides some churches or rather piles of rubbish mis-called, being destitute of doors, roofs, or any kind of ornament. The statue of Æsculapius was half as big as that of Jupiter Olympius at Athens. It was made of ivory and gold, and, as the inscription proved, by Thrasymedes son of Arignotus of Paros. He was represented sitting, holding his staff, with one hand on the head of a serpent, and a dog lying by him. Two Argive heroes, Bellerophon combating with the monster Chimæra, and Perseus severing the head of Medusa, were carved on the throne. Many tablets described the cures performed by the deity, yet he had not escaped contumely and robbery. Dionysius deprived him of his golden beard, affirming it was very unseemly in him to appear in that manner when his father Apollo was always seen with his face smooth. Sylla amassed the precious offerings belonging to him and to Apollo and Jupiter at Delphi and Olympia, to pay his army before Athens. The marks in the walls testified that a great number had been plucked down. A few fragments of white marble exquisitely carved occur in the heap of the temple. The inclosure of the temple once abounded in inscriptions. In the second century six marbles remained, on which were written in the Doric dialect the names of men and women who had been patients of the god, with the dilemma each had laboured under, and the remedies he had directed. Dr Chandler found only a couple of votive inscriptions, and two pedestals of statues, one of which represented a Roman, and was erected by the city of the Epidaurians. The Stadium was near the temple. It was of earth, as most in Greece were. At the upper end are seats of stone, but these were continued along the sides only a few yards. A vaulted passage leading underneath into the area, now choked up, was a private way by which the Agonothete or presidents with the priests and persons of distinction entered. Two large cisterns or reservoirs remain, made by Antoninus for the reception of rain-water. Beyond them is a dry water-course; and in the mountain-side on the right-hand are the marble seats of the theatre, overgrown with bushes. The springs and wells by the ruins are now supposed to possess many excellent properties. To these and a good air, Dr Chandler thinks, with the recreations of the theatre and of the stadium, and to the medicinal knowledge and experience of the priests, may be attributed both the recovery of the sick and the reputation of Æsculapius.

EPIDAUROS, with the surname *Limera*, to distinguish it from the Epidaurus of Argolis; called so, either from its meadows or its commodious harbours (Stephanus, Apollodorus): a town of Laconia, on the Ionian sea, to the south of the Sinus Argolicus, situated where now Molvasia stands, in the Morea. E. Long. 23. 30. Lat. 35. 40.

EPIDEMIA, in Grecian antiquity, festivals kept in honour of Apollo and Diana, at the stated seasons when

Epidemic when those deities, who could not be present every where, were supposed to visit different places, in order to receive the vows of their adorers.

Epictæta

EPIDEMIC, among physicians, an epithet of diseases which at certain times are popular, attacking great numbers at or near the same time.

EPIDENDRUM, in botany : A genus of the diandria order, belonging to the gynandria class of plants; and in the natural method ranking under the seventh order, *Orchidæ*. The nectarium is turbinate, oblique, and reflexed. This is the plant which produces the fruit called *vanilla*, and which is used in the making of chocolate. It is a native of Mexico, and also of some parts of the East Indies. It is a parasitic plant; the leaves of which greatly resemble the vine, and are about 18 inches long and three inches broad. The flowers are of a white colour intermixed with stripes of red and yellow. When these fall off, they are quickly succeeded by the pods, which at first are green, but afterwards, as they ripen, become yellow, and are gathered for use. The pods of the best vanilla are long, slender, and well filled with seeds. If opened when fresh, the cavity of the pod is found to contain a humid substance that is black, oily, and balsamic, of such a strong smell, that it frequently causes headaches, and even a sort of temporary intoxication. The season for gathering the pods begins about the latter end of September, and lasts till the end of December. They are dried in the shade; and when dry and fit for keeping, they are rubbed externally with a little oil of cocoa or calba, to render them supple, or preserve them the better, and to prevent them from becoming too dry or brittle. The use of this fruit is only for perfuming chocolate. In New Spain it is reckoned unwholesome; and therefore never used: but in England and other countries of Europe, it is a constant ingredient; and perhaps its noxious qualities may be corrected by the sea-air. In those countries where they grow, the plants are very easily propagated by cuttings. In this country they require to be kept in a stove, and also to be placed near some American tree, round which they may climb for their support.

EPIDERMIS, in anatomy, the cuticle or scarf-skin. See *ANATOMY*, n° 74. The word is formed of the Greek *ἐπί*, on, over; and *δέρμα*, skin.

EPIDICASIA, among the Athenians. Daughters inheriting their parents estate, were obliged to marry their nearest relation; which gave occasion to persons of the same family to go to law with one another, each pretending to be more nearly allied to the heirs than the rest. The suit was called *ἐπιδικάσιος*; and the virgin, about whom the relations contested, *ἐπίδικος*.

EPIDIDYMIS, in anatomy, a little round body, on the back of each testicle; called also *parafasta*. See *ANATOMY*, p. 738, col. 1.

EPIGÆA, in botany: A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 18th order, *Bicornes*.

EPIDOTÆ, certain deities who presided over the growth of children. They were worshipped by the Lacedæmonians, and chiefly invoked by those who were persecuted by the ghosts of the dead, &c.

EPIGASTRIC REGION, a part or subdivision of the abdomen. See *ANATOMY*, n° 88.

EPIGLOTTIS, in anatomy, one of the cartilages of the larynx or wind-pipe. See *ANATOMY*, n° 104, par. 3. and n° 116.

EPIGONI, the sons and descendants of the Grecian heroes who were killed in the first Theban war. The war of the Epigoni is famous in ancient history. It was undertaken ten years after the first. The sons of those that had perished in the first war, resolved to avenge the death of their fathers, and marched against Thebes, under the command of Thersander; or, according to others, of Alemeon the son of Amphiaræus, about 1307 years before Christ. The Argives were assisted by the Corinthians, the people of Messenia, Arcadia, and Megara. The Thebans had engaged all their neighbours in their quarrel, as in one common cause. These two hostile armies met and engaged on the banks of the Glissas. The fight was obstinate and bloody, but victory declared for the Epigoni, and some of the Thebans fled to Illyricum with Leodamas their general, while others retired into Thebes, where they were soon besieged, and forced to surrender. In this war Ægialeus was the only one who was killed, and his father Adrastus was the only one who escaped alive in the first war. This whole war, as Pausanias observes, was written in verse; and Callinus, who quotes some of the verses, ascribes them to Homer, whose opinion has been adopted by many writers. "For my part (continues the geographer), I own, that next to the Iliad and Odyssey of Homer, I have never seen a finer poem." The descendants of the veteran Macedonians, who served under Alexander the Great, and who had children by Asiatic women, were also called *Epigoni*, (Justin.)

EPIGRAM, in poetry, a short poem in verse, treating only of one thing, and ending with some lively, ingenious, and natural thought or point. The word is formed of *ἐπίγραμμα* inscription, of *ἐπιγράφω* to inscribe or write upon.

Epigrams then, originally, signify inscriptions, and they derive their origin from those inscriptions placed by the ancients on their tombs, statues, temples, triumphal arches, &c. These, at first, were only simple monograms: afterwards, increasing their length, they made them in verse, to be the more easily retained: Herodotus, and others, have transmitted to us several of them. Such little poems retained the name of epigrams, even after the design of their first institution was varied, and people began to use them for the relation of little facts and accidents, the characterizing of persons, &c. The point or turn is a quality much insisted on by the critics, who require the epigram constantly to close with something poignant and unexpected, to which all the rest of the composition is only preparatory; while others, on the contrary, exclude the point, and require the thought to be equally diffused throughout the poem, without laying the whole stress on the close: the former is usually Martial's practice, and the latter that of Catullus.

The Greek epigrams have scarce any thing of the point or briskness of the Latin ones: those collected in the Anthology, have most of them a remarkable air of ease and simplicity, attended with something just and witty;

Epigrafe
Epigram

Epigraphe
pimedi-
um.

witty; such as we find in a sensible peasant, or a child that has wit. They have nothing that bites, but something that tickles. Though they want the salt of Martial, yet to a good taste they are not insipid; except a few of them, which are quite flat and spiritless. However, the general faintness and delicacy of the pleasantry in them, has given occasion for a Greek epigram, or *epigram à la Greque*, to denote, among the French, an epigram void of salt or sharpness.

The epigram admits of great variety of subjects; some are made to praise, and others to satirize; which last are much the easiest, ill-nature serving instead of point and wit. Boileau's epigrams are all satires on one or another; those of des Reaux are all made in honour of his friends; and those of Mad. Scudery are so many eulogies. The epigram being only a single thought, it would be ridiculous to express it in a great number of verses.

EPIGRAPHE, among antiquarians, denotes the inscription of a building, pointing out the time when, the persons by whom, the uses, and the like, for which it was erected.

EPILEPSY, in medicine, the fame with what is otherwise called the *falling-sickness*, from the patient's falling suddenly to the ground. See *MEDICINE-Index*.

EPILOBIUM, the WILLOW-HERB, in botany: A genus of the monogynia order, belonging to the octandria class of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The calyx is quadrifid; the petals four; the capsule oblong inferior; the seeds pappous or downy. There are seven species, all of them natives of Britain. They grow in marshes, or under hedges in moist and shady places; having blossoms generally of a red colour, and sometimes of considerable beauty. The most remarkable is the hirsutum, commonly called *collins and cream*. The top-shoots of this plant have a very delicate fragrance; but so transitory, that before they have been gathered five minutes, it is no longer perceptible. Horses, sheep, and goats eat this plant; cows are not fond of it; swine refuse it. An infusion of the leaves of another species, the angustifolium, or rosebay willow-herb, has an intoxicating quality, as the inhabitants of Kamtschatka have learned. These people also eat the white young shoots which creep under the ground, and have a sort of ale brewed from the dried pith of it. The down of the seeds has been lately manufactured by mixing it with cotton or beaver's hair.

EPILOGUE, in oratory, the end or conclusion of a discourse, ordinarily containing a recapitulation of the principal matters delivered.

EPILOGUE, in dramatic poetry, a speech addressed to the audience, after the play is over, by one of the principal actors therein; usually containing some reflections on certain incidents in the play, especially those in the part of the person that speaks it; and having somewhat of pleasantry, intended to compose the passions raised in the course of the representation: A practice which is ridiculed by the *Spectator*; and compared to a merry jig upon the organ after a good sermon, to wipe away any impressions that might have been made thereby, and send the people away just as they came.

EPIMEDIIUM, BARREN-WORT, in botany: A genus of the monogynia order, belonging to the tetran-

dria class of plants; and in the natural method ranking under the 24th order, *Corydaleæ*. There are four nectaria, cup-shaped, and lying on the petals. The corolla is tetrapetalous, the calyx dropping off. The seed-vessel is a pod. There is only one species, viz. the alpinum. It is a low herbaceous plant, with a creeping root, having many stalks about nine inches high, each of which has three flowers composed of four leaves placed in the form of a cross. They are of a reddish colour, with yellow stripes on the border.

EPIMENIDES, an ancient poet and philosopher, was born at Gnosius in Crete. Contrary to the custom of his country, he always wore his hair long; which, according to some, was because he was ashamed of being thought a Cretan: and indeed he does not seem to have had a high opinion of his countrymen, if that verse cited by St Paul be, as it is generally believed to be, his; "The Cretans are always liars, evil beasts, slow bellies." Many stories are related of him, too wonderful to merit attention; however, his reputation was so great over all Greece, that he was there esteemed a favourite of the gods. The Athenians being afflicted with the plague, and commanded by the oracle to make a solemn lustration of the city, sent Nicias, the son of Niceratus, with a ship to Crete, to desire Epimenides to come to them. He accepted their invitation, accompanied the messengers to Athens, performed the lustration of the city, and the plague ceased. Here he contracted an acquaintance with Solon, whom he privately instructed in the proper methods for the regulation of the Athenian commonwealth. Having finished his business at Athens, the citizens offered him many valuable presents and high honours, and appointed a ship to carry him back to Crete; but he returned their presents, and would accept of nothing except a little branch of the sacred olive preserved in the citadel; and desired the Athenians to enter into an alliance with the Gnosians. Having obtained this, he returned to Crete; where he died soon after, aged 157 years; or as the Cretans, consistently with their character, pretended, 299. He was a great poet, and wrote 5000 verses on "the genealogy of the gods," 6500 "on the building of the ship Argos and Jason's expedition to Colchis," and 4000 "concerning Minos and Rhadamanthus." He wrote also in prose, "Concerning sacrifices and the commonwealth of Crete." St Jerom likewise mentions his "book of oracles and responses." The Lacedemonians procured his body, and preserved it among them by the advice of an oracle; and Plutarch tells us, that he was reckoned the seventh wise man by those who refused to admit Perander into the number.

EPIMETHEUS, a son of Japetus and Clymene, one of the Oceanides, who inconsiderately married Pandora, by whom he had Pyrrha, the wife of Deucalion. He had the curiosity to open the box which Pandora had brought with her, and from thence issued a train of evils, which from that moment have never ceased to afflict the human race. Hope was the only one which remained at the bottom of the box, not having a sufficient time to escape, and it is the alone which comforts men under misfortunes. Epimetheus was changed into a monkey by the gods, and sent into the island Pitheculæ.

EPIPHANIUS (St), an ancient father of the church;

Epimenides
Epiphanius

Epiphany
||
Epiplocele

church, born at Bēfanducan, a village in Palestine, about the year 332. He founded a monastery near the place of his birth, and presided over it. He was afterwards elected bishop of Salamis; when he sided with Paulinus against Meletius, and ordained in Palestine, Paulinian the brother of St Jerom; on which a contest arose between him and John bishop of Jerusalem. He afterwards called a council in the island of Cyprus, in which he procured a prohibition of the reading of Origen's writings; and made use of all his endeavours to prevail on Theophilus bishop of Alexandria to engage St Chrysostom to declare in favour of that decree: but not meeting with success, he went himself to Constantinople, where he would not have any conversation with St Chrysostom; and formed the design of entering the church of the apostles, to publish his condemnation of Origen; but being informed of the danger to which he would be exposed, he resolved to return to Cyprus; but died at sea, in the year 403. His works were printed in Greek, at Basil, 1544, in folio; and were afterwards translated into Latin, in which language they have been often reprinted. Petavius revised and corrected the Greek text by two manuscripts, and published it together with a new translation at Paris in 1622. This edition was reprinted at Cologne in 1682.

EPIPHANY, a Christian festival, otherwise called the *Manifestation of Christ to the Gentiles*, observed on the sixth of January, in honour of the appearance of our Saviour to the three magi or wise men, who came to adore him and bring him presents. The feast of epiphany was not originally a distinct festival; but made a part of that of the nativity of Christ, which being celebrated 12 days, the first and last of which were high or chief days of solemnity, either of these might properly be called *epiphany*, as that word signifies the appearance of Christ in the world.

The word in the original Greek, *επιφανια*, signifies *appearance* or *apparition*; and was applied, as some critics will have it, to this feast, on account of the star which appeared to the magi.—St Jerom and St Chrysostom take the epiphany for the day of our Saviour's baptism, when he was declared to men by the voice, *Hic est filius meus dilectus, in quo mihi complacuit*: "This is my beloved Son, in whom I am well pleased." And accordingly it is still observed by the Coptæ and Ethiopians in that view. Others contend, that the feast of Christmas, or the nativity of our Saviour, was held in divers churches on this day; which had the denomination *epiphany*, or *appearance*, by reason of our Saviour's first appearance on earth at that time. And it must be allowed, that the word is used among the ancient Greek fathers, not for the appearance of the star to the magi, but for that of our Saviour to the world: In which sense, St Paul uses the word *epiphania*, in his second epistle to Timothy, i. 10.

EPIPHONEMA. See ORATORY, n° 96.

EPIPHORA, in medicine, a preternatural defluxion of the eyes, when they continually discharge a sharp serous humour, which excoriates the cheeks.

EPIPHYSIS, in anatomy. See ANATOMY, p. 677. col. 2.

EPIPOCELE. in medicine, is a kind of hernia or rupture, in which the omentum subsides into the scrotum.

EPIPLOOMPHALON, in medicine, an hernia umbilicalis, proceeding from the omentum falling into the region of the umbilicus or navel.

EPIPLOON. See OMENTUM.

EPIRUS, a district of ancient Greece, bounded on the east by Etolia, on the west by the Adriatic, on the north by Thessaly and Macedonia, and on the south by the Ionian sea. This country was anciently governed by its own princes, in which state it made a very considerable figure. The country, according to Josephus, was first peopled by Dodanim the son of Javan and grandson of Japhet. The people were very warlike: but they continued in their savage state long after their neighbours were civilized; whence the Islanders used to threaten their offenders with transportation to Epirus. Their horses were in great request among the ancients, as well as the dogs produced in one of the divisions called *Molossus*; and hence these dogs were called by the Romans *Molassi*.

The history of Epirus commences with the reign of Pyrrhus the son of Achilles by Deidamia the daughter of Lycomedes king of Scyros. He is said to have behaved with great bravery at the siege of Troy; but it would appear that he behaved with no less barbarity. After the city was taken, he is said to have killed old king Priam with his own hand; to have thrown Astyanax the son of Hector and Andromache headlong from an high tower; and sacrificed Polyxena the daughter of Priam on the tomb of his father. He carried Andromache with him into Epirus, where he settled by the advice of the famous soothsayer Helenus, one of Priam's sons, who had served during the Trojan war both under his father and himself. The only remarkable period of the history of Epirus is the reign of Pyrrhus II. who made war upon the Romans. He was invited into Italy by the Tarentines; and embarked about 280 B. C. After having escaped many dangers by sea, he landed in that country, and with great difficulty gained a victory over the Romans; but he was afterwards utterly defeated by them, and obliged to return into his own country. To retrieve his honour, he then undertook an expedition against Macedonia; where he overthrew Antigonus, and at last made himself master of the whole kingdom. He then formed a design of subduing all the other Grecian states; but met with such an obstinate resistance at Lacedæmon, that he was obliged to drop the enterprise; and was soon after killed at the siege of Argos by a woman, who from the wall threw a tile upon his head. Deidamia, the grand-daughter of Pyrrhus, was the last that sat on the throne of Epirus. She is said to have been murdered after a short reign; upon which the Epirots formed themselves into a republic.

Under the new form of government Epirus never made any considerable figure, but seems rather to have been dependent on the kingdom of Macedonia. The Romans having conquered Philip king of that country, restored the Epirots to their ancient liberty; but they, forgetful of this favour, soon after took up arms in favour of Perseus. As a punishment for this ingratitude, the Romans gave orders to Paulus Emilius, after the reduction of Macedonia, to plunder the cities of Epirus, and level them with the ground. This was punctually executed throughout the whole country on the same day and at the same hour. The booty was sold, and each

See Rom.

EPIRUS,
EPISCOPACY

each foot-soldier had 200 denarii, that is, six pounds nine shillings and two pence, and each of the horse the double of this sum. An hundred and fifty thousand men were made slaves, and sold to the best bidder for the benefit of the republic. Nor did the vengeance of Rome stop here; all the cities of Epirus, to the number of 70, were dismantled, and the chief men of the country carried to Rome, where they were tried, and most of them condemned to perpetual imprisonment. After this terrible blow, Epirus never recovered its ancient splendor. Upon the dissolution of the Achaean league, it was made part of the province of Macedonia; but when Macedonia became a diocese, Epirus was made a province of itself, called the province of *Old Epirus*, to distinguish it from *New Epirus*, another province lying to the east of it. On the division of the empire, it fell to the emperors of the east, and continued under them till the taking of Constantinople by the Latins, when Michael Angelus, a prince nearly related to the Greek emperor, seized on Etolia and Epirus, of which he declared himself despot or prince; and was succeeded by his brother Theodorus, who took several towns from the Latins, and so far enlarged his dominions, that, disdaining the title of *despot*, he assumed that of *emperor*, and was crowned by Demetrius archbishop of Bulgaria. Charles, the last prince of this family, dying without lawful issue, bequeathed Epirus and Acarnania to his natural sons, who were driven out by Amurath the second. Great part of Epirus was afterwards held by the noble family of the Calabriots; who, though they were masters of all Albania, yet styled themselves princes of Epirus. Upon the death of the famous George Calabriot, surnamed *Scanderbeg*, Epirus fell to the Venetians, who were soon dispossessed of it by the Turks; in whose hands it still continues, being now known by the name of *Albania*, which comprehends the Albania of the ancients, all Epirus, and that part of Dalmatia which is subject to the Turks.

EPISCOPACY, that form of church-government, in which diocesan bishops are established as distinct from and superior to priests or presbyters. We have already observed, that it is a long time since the ministers of religion have been distinguished into different orders, and that it has been much controverted whether the distinction be of divine or human right; whether it was settled in the apostolic age or afterwards. (See BISHOP.) This controversy commenced soon after the Reformation; and has been agitated with great warmth between the *Episcopalians* on the one side, and the *Presbyterians* and *Independents* on the other. Among the protestant churches abroad, those which were reformed by *Luther* and his associates are in general *episcopal*; whilst such as follow the doctrines of *Calvin* have for the most part thrown off the order of bishops as one of the corruptions of popery. In *England*, however, the controversy has been considered as of greater importance than on the *Continent*: for it has there been strenuously maintained by one party, that the *episcopal order* is essential to the constitution of the church; and by others, that it is a pernicious encroachment on the rights of men, for which there is no authority in scripture. Though the question has for some time lain almost dormant, and though we have no desire to revive it; yet as a work of this kind might perhaps be deem-

ed defective, did it contain no account whatever of a *Episcopacy*. controversy which has employed some of the ablest writers of the past and present centuries, we shall give a fair though short view of the chief arguments, by which the advocates of each contending party have endeavoured to support their own cause, leaving our readers to judge for themselves where the truth lies. See *INDEPENDENTS* and *PRESBYTERIANS*.

The *Independent* maintains, that under the gospel ²the independent scheme. dispensation there is nothing which bears the smallest resemblance to an exclusive priesthood; that Christ and his apostles constituted no permanent order of ministers in the church; but that any man who has a firm belief in revelation, a principle of sincere and unaffected piety, a capacity for leading devotion and communicating instruction, and a serious inclination to engage in the important employment of promoting the everlasting salvation of mankind; is to all intents and purposes a regular minister of the New Testament, especially if he have an invitation to the pastoral office from some particular society of Christians.

Against this scheme, which supposes the rights of Christians all equal and common, and acknowledges no authority in the church except what may be derived from the election of her members, the Protestant *Episcopalian* reasons in the following manner. He admits, ³Episcopacy. an undoubted truth, that our blessed Lord gave to arguments none of his immediate followers authority or jurisdiction against it. of such a nature as could interfere with the rights of the civil magistrate, for all such authority was disclaimed by himself: "My kingdom (said he to Pilate) is not of this world:" and to a certain person who asked him to decide a question of property between him and his brother, he replied, "Man, who made me a judge or a divider over you?" But when it is considered, that Christ came into this world to "turn men from darkness to light, and from the power of Satan to the living God; that he gave himself for us, that he might redeem us from all iniquity, and purify to himself a peculiar people zealous of good works;" that of these works many are such as unregenerate humanity has no inclination to perform, and that the doctrines which he revealed are such as human reason could never have discovered; the advocate for episcopacy thinks it was extremely expedient, if not absolutely necessary, that, when he ascended into heaven, he should establish upon earth some authority to illustrate the revelation which he had given, and to enforce obedience to the laws which he had enacted. There is nothing, continues he, more strictly required of Christians, than that they live together in unity, professing the same faith, joining in the same worship, and practising the same virtues. But as men have very different passions, prejudices, and pursuits, such unity would be impossible, were they not linked together in *one society* under the Christians' government of persons authorized to watch over the linked to-⁴ the kingdom of God. rity of the faith, to prescribe the forms of public together in worship, and to explain the nature and inculcate the necessity of the several virtues. The society of *Christians*, in respect of its unity and organization, is compared to the human body: for "as we have many members in one body, and all members have not the same office; so we being many are one body in Christ, and every one members one of another," (Rom. xii. 4, 5.) It is called the *church*, the *kingdom of heaven*, and

⁵ *Episcopacy*. and the kingdom of God; and its affairs, like those of every other kingdom, are administered by proper officers in subordination to the ONE LORD, who, "when he ascended up on high, and led captivity captive, gave some apostles, and some prophets, and some pastors and teachers, for the perfecting of the saints, for the work of the ministry, for the edifying of the body of Christ;" (Ephes. iv. 8—13.) That those various orders of ministers were vested with real authority in the church, might be inferred from principles of reason as well as from the dictates of revelation. A society without some sort of government, government without laws, or laws without an executive power, is a direct absurdity. Where there are laws, some must govern, and others be governed; some must command, and others obey; some must direct, and others submit to direction. This is the voice of nature; it is likewise the language of scripture. "Obey them (says the inspired author of the epistle to the Hebrews) who have the rule over you, and submit yourselves: for they watch for your souls as they that must give account." A text which shows that the authority of the ministers of religion was distinct from that of the civil magistrate, whose duty is to watch, *not for the souls*, but for the *lives and properties*, of his subjects.

The church governed by proper officers.

⁶ All Christians required to be members of the church.

Of the society thus constituted, it was not, as of a philosophical sect, left to every man's choice whether or not he would become a member. All who embrace the faith of the Redeemer of the world are required to be baptized, under the pain of forfeiting the benefits of redemption: but one great purpose for which baptism was instituted, is to be the rite of initiation into the church of Christ; "for by one spirit are we all baptized into one body, whether we be Jews or Gentiles, whether we be bond or free," (1 Cor. xii. 13.) Of baptism, whatever be the importance, it is evident, that to receive it, is not, like the practice of justice, or the veneration of the Supreme Being, a duty resulting from the relations of man to his Creator and fellow-creatures; that its whole efficacy, which in scripture is said to be nothing less than the remission of sins, is derived from positive institution; and therefore, that the external rite can be of no avail, but when it is administered in the manner prescribed, and by a person authorized to administer it. That all Christians are not vested with this authority, as one of the common privileges of the faith, appears from the commission which our Saviour after his resurrection gave to his apostles. At that period, we are assured that the number of his followers was not less than five hundred; yet we find, that to the eleven disciples only did "he come and speak, saying, All power is given unto me in heaven and in earth; go ye, therefore, and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost."

Of the 500 disciples there is surely no reason to believe that there were not many well qualified to instruct either a Jew or a Gentile in the doctrines of the gospel; and it is certain, that any one of them could have washed his convert with water in the name of the Holy Trinity as well as St Peter or St John: but such an unauthorized washing would not have been Christian baptism, nor of equal validity with it, any more than the opinion of a lawyer at the bar is the judgment of a court of justice, or of equal obligation. It is the com-

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mission of the sovereign which gives force to the judgment of the court; it is the commission of Christ which gives validity to baptism. The same reasoning is applicable to the Lord's supper, which, if it be not administered by those who have authority for such administration, cannot be deemed a sacrament of Christ's institution.

These two rites are the external badges of our profession. By the one, we are incorporated into that society of which our Redeemer is the head and sovereign: in the celebration of the other, we have a right to join, whilst of that society we continue members. But if by an open and scandalous disregard of the precepts of the gospel, we should prove ourselves unworthy of its privileges, the same persons who are authorized to admit us into the church, are likewise vested with authority to call us out of it; for to them were given "the keys of the kingdom of heaven (or the church), with assurance, that whatsoever they should bind on earth, should be bound in heaven; and whatsoever they should loose on earth, should be loosed in heaven," (Mat. xviii. 18.) As baptism is to be administered so long as there shall be persons to be enlisted under the banners of Christ, and the Lord's Supper to be celebrated so long as it shall be the duty of soldiers to adhere to the standard of their leader and their head; and as it is likewise to be feared that there will never come a time when all Christians shall "walk worthy of the vocation wherewith they are called;" it follows, that this power of the keys which was originally given to the apostles, must continue in the church through all ages, even unto the end of the world. But as we have seen, that it was not at first intrusted to all the disciples in common, as one of the privileges inseparable from their profession, and as no body of men can possibly transfer an authority of which they themselves were never possessed; it is certain, that even now it cannot, by the election of one class of Christians, be delegated to another, but must, by some mode of succession, be derived from the apostles, who were sent by Christ as he was sent by his Father. To argue from the origin of civil to that of ecclesiastical government, although not very uncommon, the Episcopalian deems extremely fallacious. Of the various nations of the world, many of the sovereigns may indeed derive their authority from the suffrages of their subjects; because in a state of nature, every man has an inherent right to defend his life, liberty, and property; and what he possesses in his own person, he may for the good of society transfer to another: but no man is by nature, or can make himself, a member of the Christian church; and therefore authority to govern that society can be derived only from him by whom it was founded, and who died that he might "gather together in one all the children of God."

Against such reasoning as this it hath been urged, that to make institutions, which like baptism and the Lord's supper are generally necessary to the salvation of all Christians, depend for their efficacy upon the authority or commission of a particular order, appears inconsistent with the wisdom and goodness of God; as by such an economy an intolerable domination would be established over the souls of men, and the purpose for which the Saviour of the world died might be in some degree defeated by the caprice of an ignorant and

⁸ Christians as a body cannot transfer to any one of their number an authority of which they were never possessed.

⁷ All Christians not authorized to administer the sacraments.

⁹ Authority to govern the church can be derived only from Christ.

¹⁰ An objection answered.

arbi-

arbitrary priesthood. The objection is certainly plausible; but the Episcopalian affirms, that either it has no weight, or militates with equal force against all religion, natural as well as revealed, and even against the wisdom of Providence in the government of this world. —In every thing, he observes, relating to their temporal and to their spiritual interests, mankind are all subjected to mutual dependence. The rich depend upon the poor, and the poor upon the rich. —An infant neglected from the birth, would barely cry and cease to live; nor is it easily to be conceived, that in the more rigid climates of the earth, a full grown man could provide even the necessities of mere animal life. Of religion, it is certain that in such a state nothing could be known; for there is not the smallest reason to imagine that any individual of the human race—an *Aristotle*, a *Bacon*, or a *Newton*, had he been left alone from his infancy, without culture and without education,—could ever, by the native vigour of his own mind, have discovered the existence of a God, or that such speculations as lead to that discovery would have employed any portion of his time or his thoughts. Even in civilized society it would be impossible, in the present age, for any man, without the assistance of others, to understand the very first principles of our common Christianity; for the scriptures, which alone contain those principles, are written in languages which are now no where vernacular. In the fidelity of translators, therefore, every illiterate disciple of Jesus *must* confide, for the truth of those doctrines which constitute the foundation of all his hopes; and as no man ever pretended that the Christian *sacraments* are more necessary to salvation than the Christian *faith*, the Episcopalian sees no impropriety or inconsistency in making those persons receive baptism and the Lord's supper by the ministrations of others, who by such ministrations must of necessity receive the truths of the gospel.

By such arguments as these does the Episcopalian endeavour to prove that Christ constituted some *permanent order of ministers* in the church, to whom in the externals of religion the great body of Christians are commanded to pay obedience; and thus far the Presbyterian agrees with him; but here their agreement ends. They hand in hand attack the Independent with the same weapons, and then proceed to attack each other. The one maintains, that originally the officers of the Christian church were all *presbyters* or *elders of one order*, and vested with *equal powers*; whilst the other holds, that Christ and his apostles appointed *divers orders* of ministers in the church; that of these orders the highest alone was empowered to ordain others; and that therefore obedience, as to those who watch for our souls, can be due only to such as are *episcopally ordained*.

In behalf of the Presbyterian plea it is urged, that the titles of *bishop* and *presbyter*, being in the New Testament indifferently given to the same persons, cannot be the titles of distinct ecclesiastical officers; which appears still more evident from the ordination of *Timothy*, who, although he was the first *bishop* of Ephesus, received his episcopal character by the imposition of the hands of the *presbtery*. —That one and the same man is, in the New Testament, styled sometimes a *bishop* and sometimes a *presbyter*, cannot be denied; but although every episcopal bishop was therefore undoubtedly a

presbyter, it does not of course follow, says the Episcopalian, that every presbyter was likewise a bishop. In the *Old Testament*, Aaron and his sons are without any discrimination of order frequently styled *priests*; and in the *New*, both St Peter and St John call themselves *presbyters*, as St Paul, upon one occasion, styles himself a *deacon*—*διακονος*, (Eph. iii. 7.); yet no man ever supposed those apostles to have been such ecclesiastical officers as modern presbyters and deacons; and it is universally known that in the Jewish priesthood there were different orders, and that Aaron was of an order superior to his sons. This being the case, the presbyters, by the laying on of whose hands Timothy was made a bishop, *may have been* of the same order with St Peter and St John; and if so, it follows that his ordination was *episcopal*. At all events, we are certain, continues the advocate for Episcopacy, that it was not, in the modern sense of the word, *Presbyterian*; for the gift, which in the first epistle is said to have been “given by prophecy with the laying on of the hands of the presbtery,” is in the second said to have been “in him by the putting on of the hands of St Paul.” And here it is worthy of observation, that the preposition used in the former case is *αυτου*, which signifies *concurrent* rather than *instrumentality*; but *that* in the latter is *εκα*, which, as every Greek scholar knows, is prefixed to the *instrumental cause* by which any thing is effected: so that whatever may have been the order of the presbyters who *concurrent*, St Paul appears to have been the *sole* ordainer. But by the confession of all parties, St Paul was a bishop in the highest sense in which that word is ever used; and the powers of the episcopate not being parcelled out among various partners, of whom each possesses only a share, the imposition of his hands was sufficient for every purpose which could have been effected by the hands of the whole college of apostles.

It appears, therefore, that from the promiscuous use of the titles *bishop* and *presbyter*, and from the ordination of *Timothy*, nothing can with certainty be concluded on either side of this celebrated question. But if, instead of resting in mere *words*, which, when taken alone and without regard to the context, are almost all of ambiguous signification, we attend to some important *facts* recorded in the New Testament, the Episcopalian thinks we shall in them discover sufficient evidence that the government of the primitive church was prelatial.

During our Saviour's stay upon earth, it is undeniable that he had under him two distinct orders of ministers—the twelve, and the seventy; and after his ascension, immediately before which he had enlarged the powers of the *eleven*, we read of *apostles*, *presbyters*, and *deacons*, in the church. That the presbyters were superior to the deacons, and the apostles superior to both, is universally acknowledged; but it has been said that in scripture we find no intimation that the apostolic order was designed for continuance. A Quaker says the same thing of water-baptism; and the Episcopalian observes, that it would be difficult to point out by what passage of scripture, or what mode of reasoning, those who, upon this plea, reject the apostolic order of Christian ministers, could overthrow the principles upon which the disciples of *George Fox* reject the use of that rite which our Saviour instituted

Episcopacy.
Episcopal arguments against it.

Episcopacy—tuted for the initiation of mankind into his church. They were the *eleven* alone to whom Christ said, "Go ye therefore and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost;" and therefore, although we frequently find presbyters and deacons administering the sacrament of baptism, we must conclude, that as a *judge* administers justice by authority derived from his *sovereign*, so those *inferior officers* of the church administered baptism by authority derived from the *apostles*. Indeed, had they pretended to act by any other authority, it is not easily to be conceived how their baptism could have been the baptism instituted by Christ; for it was not with the *external washing* by whomsoever performed, but with the *eleven* and their successors, that he promised to be "always, even unto the end of the world."

That the *eleven* did not consider this promise, or the commission with which it was given, as terminating with their lives, is evident from their admitting others into their own order; for which they had competent authority, as having been sent by Christ as he was sent by his Father. When St Paul, to magnify his office and procure to it from the Galatians due reverence, styles himself, "an apostle not of men, neither by man, but by Jesus Christ and God the Father," he must have known some who derived their apostolic mission *by man*; otherwise he could with no propriety have claimed particular respect, as he evidently does, from what was in his own apostleship no particular distinction. At that very early period, therefore, there must have been in the church *secondary* apostles, if they may be so called, upon whom, by imposition of hands, or by some other significant ceremony, the eleven had conferred that authority which was given to them by their Divine Master. Such were *Matthias* and *Barnabas*; such likewise were *Timothy*, *Titus*, and the *angels* of the seven churches in Asia, with many others whose names and offices are mentioned in the New Testament.

That *Matthias* and *Barnabas* were of the apostolic order, has never been controverted; and that *Timothy* and *Titus* were superior to modern presbyters, is evident from the offices assigned them. Timothy was, by St Paul, empowered to *preside* over the presbyters of Ephesus, to receive accusations against them, to *exhort*, to *charge*, and even to *rebuke* them; and Titus was, by the same apostle, left in Crete for the express purpose of setting things in order, and ordaining *presbyters* in every city. To *exhort*, to *charge*, and with authority to *rebuke* one's equal, is certainly incongruous; and therefore the Episcopalian thinks the powers conferred on Timothy altogether inconsistent with that parity of order and of office for which his antagonists so strenuously plead. Even the commission given to Titus appears in his eyes by much too extensive for a Presbyterian minister, who, after having ordained in *one* city, could not have proceeded to ordain in *another* without the consent and assistance of his brother and fellow-labourer. With respect to the *angels* of the Asiatic churches, he observes, that in the Old Testament the title of *angel* is sometimes given to the *Jewish high-priests*, and particularly by the prophet Malachi, who calls him "the messenger (*אֲנִיכִי*) of the Lord of Hosts;" and that the *angels* of the churches mention-

ed by St John, were *Christian high-priests*, or *bishops*.¹⁷ *Episcopacy* presiding over more than one congregation, as it is affirmed by all the ancient writers, cannot, he thinks, be denied by any man who will take the trouble to compare scripture with scripture. We read (Acts xix. 10, and 20.), that "in the space of two years all they who dwelt in Asia heard from St Paul the word of the Lord Jesus, both Jews and Greeks; and that there the word of God grew mightily and prevailed;" but with what truth or propriety could this have been said, if at the time of St John's writing the Apocalypse, which was 30 years after St Paul's death, all the Christians of Proconsular Asia were comprised in *seven congregations*, which assembled, each with its proper pastor, to perform, in *one place*, the duties of public worship? In a word, the advocate for episcopacy insists, that no man, who reads without prejudice the acts of the apostles, the epistles of St Paul, and the Apocalypse of St John, can seriously believe that *Timothy*, *Titus*, *Epaphroditus*, *Sosthenes*, and *Silvanus*, with the *angels* of the seven churches in Asia, were mere *presbyters*, or that the government of the church was, in those days, by a college of elders.

When from the inspired penmen of the New Testament he proceeds to examine the succeeding writers of the Christian church, the Episcopalian finds such multiplied and concurring evidence of the apostolic institution of episcopacy, as he thinks it impossible to resist without denying the truth of all ancient history, and even shaking the pillars of revelation itself; for "in the noble army of martyrs," the witnesses of the episcopal government of the church are earlier, and by far more numerous, than those who testify that the *gospel of St Matthew* was written by that apostle, or that the book of the *Apocalypse* is canonical scripture. The authority of the *Fathers* indeed is at present very low; but should they be allowed to be as fanciful divines and as bad critics as their worst enemies are pleased to represent them, this would detract nothing from their evidence when they bear witness to the constitution of the church in their own times; for of their *integrity* there can be no doubt: and what the Episcopalian wants of them is only their testimony to matters of fact which fell under the cognizance of their own senses, and about which therefore they could not be deceived. It is here indeed chiefly that he triumphs over his antagonists. In the second and third centuries there was no general council, nor any Christian sovereign. A prelacy therefore, he urges, ¹⁷ *The divine right of episcopacy* could not have been *universally* introduced, during that period, either by a concert among the clergy, or by the authority of the civil magistrate. Yet that even then there was no church under heaven, of which the government was not episcopal, has been confessed by some of the most learned writers among the Presbyterians themselves; whence he concludes that episcopacy is of divine institution.

The candid Episcopalian, however, allows, that in the apostolic age there may have been some churches which at first had only bishops and deacons to perform the offices of religion; for when the number of disciples in any place was so small that they could all meet in one assembly, there was no necessity for any other order of ministers: but it appears that, from the very *beginning*, *bishops*, *presbyters*, and *deacons*, were settled in

15
The apostolic or highest order designed to be permanent.

16
Matthias, Barnabas, Timothy, Titus, and the angels of the seven churches in Asia, *bishops*.

17
The divine right of episcopacy.

episcopacy all the *larger* cities of the Roman empire; and it was in those days an allowed maxim, that without a *bishop* there could be *no church*. The better to understand the original state and institution of episcopacy, it is necessary to observe, that the empire, which contained almost all the known part of the Christian world, was by Augustus Cæsar divided into provinces, subjected each to the authority of one chief magistrate, who was commonly a *prætor* or *proconsul*, and who resided in the metropolis or chief city of the province. A province comprehended the cities of a whole region; and in the age of the apostles, each city was under the immediate government of certain magistrates within its own body, known by the name of *βουαι*, or *senatus*, *ordo* and *curia*, "the states and court of the city." Those magistrates were subordinate to the *prætor* or *proconsul*: but among them there was one superior to the rest, called sometimes *dictator*, and sometimes *defensor civitatis*, whose jurisdiction extended not only over the city itself, but likewise over all the adjacent territory. That territory was denominated *propositus*, or the suburbs, and often reached to the distance of 10 or 12 miles round the city, and sometimes much farther, containing within it many villages and small towns under the government of the city magistrates. From some passages in the New Testament, and from the concurring evidence of the earliest writers of the church, it appears to have been the purpose of the apostles to settle a bishop in *every* city where there was a civil magistracy: but as they could not be personally present in all places at once, it was natural for them to enter upon the great work of converting the nations, by *first* preaching the gospel in that city of each province which was the ordinary residence of the governor; because to it there must have been the greatest resort of people, who would carry the glad tidings with them into the country when they returned. Accordingly, having dispersed themselves over the empire, and made numbers of proselytes in the principal cities, they fixed in each, where they saw it necessary, a *bishop*, with a college of *presbyters* and *deacons*; and gave to those bishops, who were at first called *apostles*, a commission, as the *other* cities of the province should be converted, to fix in them bishops also.

In some of the smaller cities, it is extremely probable that a bishop and a deacon were for a short time the only ecclesiastical officers, till the number of Christians increased so much as to make it impossible for them all to assemble in one house for the purposes of public worship. The bishop then ordained *presbyters* to officiate in those congregations where he himself could not be present, and to assist him in other parts of his pastoral office; but in all their ministrations the *presbyters* were subordinate to him, who was the chief pastor within the city, who composed the prayers which were offered up in public, and to whom all the other ministers of religion were accountable for their conduct. So long as the number of the faithful was confined within the *walls* of the city, it appears that the bishop with his *presbyters* and *deacons* lived together as in a college; that divine service was every Lord's-day, or oftener, performed in what was afterwards called the cathedral or mother-church, by the bishop himself, assisted by some of his clergy; and that the congregations which met in other churches, having no *fixed*

pastors, were supplied by such *presbyters* as the bishop chose to send to them from his own church. Whilst matters continued in this state, the clergy had no other revenues than what arose from the voluntary oblations of the people; which were indeed so large as not only to support them with decency, but likewise to answer other ends of charity and munificence. They were commonly divided into four equal parts; of which one was allotted to the bishop, a second to the inferior clergy, a third to the poor, and a fourth to keep the churches in repair; and it was considered as part of the bishop's duty to take care that the offerings should be faithfully applied to these purposes.

When converts increased in number, and churches were built in the suburbs, each of those churches had of course a fixed pastor similar to a parish-priest among us; but still those pastors, as well as the city-clergy, ministered in subordination to the bishop, whose authority extended as far as the civil authority of the Roman magistrate, within which district or diocese it was supreme over all orders of Christians. This every man knows who is acquainted with ecclesiastical history; for the bishop alone could ordain *priests* and *deacons*, administer the rite of *confirmation*, *absolve penitents* who were under church-censure, and *exclude from communion* heretics and notorious offenders; and from his sentence there lay no appeal but to a synod of comprovincial bishops.

Such synods were in each province convened by the bishop of the chief city; for the apostles having been careful to place in those cities men of the most eminent gifts and abilities, the other bishops of the provinces applied to them for advice upon every emergency, and paid a particular deference to them upon every occasion. So that though all bishops were of equal authority as *bishops*, yet when they met to consecrate a new bishop, or to deliberate upon the affairs of the church, they yielded a precedence to the bishop of the metropolis, who called them together, and who sat as *president* or *moderator* of the synod. Hence the origin of metropolitans or *archbishops*; whose authority was so considerable, that though there is not a doubt but the election of bishops was anciently placed in the clergy and people of the vacant diocese, yet the bishop *elect* could not be consecrated without the consent of the archbishop of the province.

In consequence of the extensive powers with which the primitive bishops were vested, they are commonly styled in the writings of those times *presidents*, *provosts*, or *inspectors* of the church, *chief priests*, *princes of the clergy*, and even *princes of the people*; but their authority was wholly spiritual. Those prelates, imitating the example of their Divine Master when on earth, neither possessed nor assumed to themselves any jurisdiction over the *properties* or *civil rights* of men. In consequence of St Paul's having reprimanded the Corinthians for going to law before the *unbelievers*, they were indeed often chosen as *arbiters* of such civil disputes as arose between individuals under their episcopal government; but on these occasions they could not act unless the submission was *voluntarily* made by *both* the contending parties, and then their decision was final. When the empire became Christian, this privilege was confirmed to them by law; for any *civil* cause depending before a court of justice could be withdrawn, and by the mutual consent of parties be submitted

Episcopacy. submitted to the arbitration of the bishop, whose award, which in former times could be enforced only by the terror of church-censures, was then enforced by the secular magistrate. In criminal causes, where the trial might be for life or death, they were prohibited both by the canons of the church and by the laws of the state from acting as judges; and therefore they never suffered such causes to come before them, except when it was necessary that the person accused, if found guilty, should be excluded from the communion of the faithful. But they had so many civil causes flowing in upon them, that they were soon obliged to devolve part of that care upon other persons in whose knowledge, prudence, and integrity, they could fully confide; and as the persons employed to act in the bishop's stead were often *laymen*, it has been conjectured that they gave rise to the office of *lay-chancellor* in the church, and to all that train of spiritual judges and spiritual courts against which such numbers are disposed to clamour.

21
The probable origin of spiritual courts.

22
Bishops had no civil rank till after the subversion of the Roman empire and the conversion of the Gothic nations.

Be this as it may, it is certain that, through the piety and munificence of the Christian emperors, the bishops enjoyed large revenues and many valuable privileges; but it does not appear that they had any rank or authority, as *barons* or *temporal princes*, till the Gothic nations, which subverted the Roman empire, had embraced the Christian faith. As Christianity incapacitated the leaders of those tribes from officiating as chief priests at the religious rites which were usually celebrated at the opening of their public assemblies, the bishops came naturally to discharge that duty on such occasions, when they must have shared in the rank by sharing in the functions of the chief. The situation in which they thus appeared at the opening of all political conventions, would enable them to join with much effect in the deliberations which ensued; and their superior knowledge, their sacred character, and their influence with the people, would soon acquire them power equal to their rank. They must therefore have been well intitled to demand admission into that council which was formed by the king and the lay-chiefs at the national assemblies: and as they balanced the authority of those chiefs, we cannot doubt that the king would be disposed to give the utmost effect to their claim. Accordingly, we find the dignified clergy, who received large grants of land to be held on the same tenures with the lands of the lay magistrates, presiding along with those magistrates in the provincial assemblies of every degree in all the Gothic nations, and enjoying every advantage in point of rank and authority in their national diets. Hence the bishop of Rome, and several bishops in Germany, have like the dukes and marquises of that empire, been for a long time sovereign princes; and hence too the bishops of England and Ireland have always sat, and have an equal right with the lay-peers to sit, in the upper house of parliament. It is however obvious, that, so far as episcopacy is of *apostolical* institution, those peers and princes possess not the *original* character in any higher degree than the bishops in America, who are barely tolerated, or than those in Scotland who do not enjoy that privilege; and that confirmation administered, or holy orders conferred, by a persecuted prelate, must be as effectual to the purposes of religion, as if given by a German prince or an English peer.

In this short view of episcopacy, it has been our endeavour to do justice to the subject, without suffering ourselves to be influenced by partiality or prejudice. As we are not ourselves episcopals, we have advanced nothing of our own; but have selected from English writers, who have at different times undertaken to defend the *divine right* of episcopacy, such facts and arguments as to us appear to be of the most importance, or to have the greatest weight, without remarking upon them, or offering any answer. The reasoning employed to prove that the order of bishops was instituted by the apostles, is taken from a work prepared for the press by Dr Berkeley prebendary of Canterbury, and son of the celebrated bishop of Cloyne. For the rest of the detail, we are indebted chiefly to Bingham's *Origines Ecclesiasticæ*; a performance in great estimation with those English divines who are commonly known by the appellation of *high churchmen*. As editors of a work of this kind, it is not our business to be of any party, or to support, in opposition to all others, a particular church, though that church should be our own: We shall therefore treat *independency* and *presbytery* as we have treated *episcopacy*, by employing some able writer of each society to plead his own cause. Mean while, we shall conclude this article with a few reflections, which, though they come from the pen of an obscure author, deserve to be engraved deep in the memory of every contrivert of every communion.

23
Moderation in controversy recommended.

"On complicated questions (says a late apologist for the episcopal church in Scotland), men will always differ in opinion; but conscious each of the weakness of his own understanding, and sensible of the bias which the strongest minds are apt to receive from thinking long in the same track, they ought to differ with charity and meekness. Since unhappily there are still so many subjects of debate among those who name the name of Christ; it is doubtless every man's duty, after divesting himself as much as possible of prejudice, to investigate those subjects with accuracy, and to adhere to that side of each disputed question which, after such investigation, appears to him to be the truth: but he transgresses the favourite precept of his divine Master, when he casts injurious reflections, or denounces anathemas, upon those who, with equal sincerity, may view the matter in a different light; and by his want of charity does more harm to the religion of the *Prince of Peace*, than he could possibly do good, were he able to convert all mankind to his own orthodox opinions."

EPISCOPAL, something belonging to BISHOPS.

EPISCOPALIANS, in church-history, an appellation given to those who prefer the episcopal government and discipline to all others. See EPISCOPACY.

By the test act, none but Episcopals, or members of the church of England, are qualified to enjoy any office civil or military.

EPISCOPIUS (Simon), one of the most learned men of the 17th century, and the chief supporter of the Arminian sect, was born at Amsterdam in 1583. In 1612, he was chosen divinity professor at Leyden, in the room of Gomarus, who resigned; and the functions of his office, with his private studies, were light burdens to him, compared with the difficulties he sustained on account of the Arminian controversy: which, though it began in the universities, soon flew to the pulpits,

pulpits, from whence it spread and inflamed the people. The states of Holland having invited Episcopos to take his place at the synod of Dort, he went thither accompanied by some remonstrant ministers; but the synod would not allow them to sit as judges, nor to appear in any other capacity than as persons summoned before them: they submitted, were deposed from their functions, and banished the territories of the commonwealth. Episcopos and his persecuted brethren retired to Antwerp; but the times growing more favourable, he returned to Holland in 1626, and was made minister of the church of the Remonstrants at Rotterdam: in 1634, he was chosen rector of the college founded by his sect at Amsterdam, where he spent the remainder of his days. He died in 1643, of the same disorder which had killed his wife before, a retention of urine; having lost his sight some weeks previous to his end. The learned have bestowed great eulogiums on Episcopos; but he did not always write with that moderation which might have been wished. His works make two volumes in folio, of which the second consists of posthumous publications.

EPISCOPUS, the same with bishop. See BISHOP and EPISCOPACY.

EPISODE, in poetry, a separate incident, story, or action, which a poet invents, and connects with his principal action, that his work may abound with a greater diversity of events; though, in a more limited sense, all the particular incidents whereof the action or narration is compounded, are called *episodes*. See POETRY.

EPISPASTIC, in medicine, a topical remedy, which being applied to the external parts of the body, attracts the humours to that part.

EPISTATES, in the Athenian government, was the president of the proedri. See PROEDRI.

EPISTEMONARCH, in the ancient Greck church, an officer of great dignity, who had the care of every thing relating to faith, in the quality of censor. His office answered pretty nearly to that of master of the sacred palace at Rome.

EPISTLE, denotes the same with a missive letter; but is now chiefly used in speaking of ancient writings, as the epistles of St Paul, epistles of Cicero, epistles of Pliny, &c.

Epistles and Gospels, in the liturgy of the church of England, are select portions of scripture, taken out of the writings of the evangelists and apostles, and appointed to be read, in the communion-service, on Sundays and holidays. They are thought to have been selected by St Jerom, and by him put into the lectionary. It is certain, they were very anciently appropriated to the days whereon we now read them, since they are not only of general use throughout the western church, but are also commented upon in the homilies of several ancient fathers, which are said to have been preached upon those very days to which these portions of scripture are now affixed.

The epistles and gospels are placed in an admirable order and method, and bear a special relation to the several days whereon they are read. The year is distinguished into two parts; the first being designed to commemorate Christ's living among us, the other to instruct us to live after his example. The former takes in the whole time from Advent to Trinity-Sunday; the

latter, all the Sundays from Trinity to Advent. During the first of these seasons, the epistles and gospels are calculated to raise in us a grateful sense of what our Saviour did and suffered for us, and set before our eyes his nativity, circumcision, and manifestation to the Gentiles; his doctrines and miracles; his baptism, fasting, and temptation; his agony and bloody sweat; his cross and passion; his death, burial, resurrection, and ascension; and his mission of the Holy Ghost. During the second season of the year, the epistles and gospels tend to instruct us in the true paths of Christianity. See COLLECTS.

EPISTOLARY, something belonging to an epistle. See EPISTLE.

EPISTOLARY Composition. See LETTER; and the article POETRY.

EPISTROPHE. See ORATORY, n° 71.

EPISTYLE, in the ancient architecture, a term used by the Greeks for what we call *architrave*, viz. a massive piece of stone or wood, laid immediately over the capital of a column.

EPITAPH (from *ἐπι* upon, and *τάφος* sepulchre), a monumental inscription, in honour or memory of a person deceased. It has been disputed whether the ancient Jews inscribed epitaphs on the monuments of the dead; but be this as it will, epitaphs it is certain, of very ancient date, are found amongst them.—The Athenians, by way of epitaph, put only the name of the dead, with the epithet *καλός*, signifying "good," or *ἥρως* "hero," and the word *χαίρει*, signifying their good wishes: The name of the deceased's father and his tribe were frequently added.—The Lacedaemonians allowed epitaphs to none but those who had died in battle. The Romans inscribed their epitaphs to the *manes*, *dis manibus*; and frequently introduced the dead by way of propositio, speaking to the living; of which we have a fine instance, worthy the Augustan age, wherein the dead wife thus bespeaks her surviving husband:

*Immatura peris; sed tu, felicit, annos
Vive tuus, conjux optime, vive meos.*

The epitaphs of the present day are generally crammed with fulsome compliments which were never merited, characters which human nature in its best state could scarce lay claim to, and expressions of respect which were never paid in the life-time of the deceased. Hence the proverb with great propriety took its rise, "He lies like an epitaph."

EPITAPH, is also applied to certain clozes, either in prose or in verse, composed without any intent to be engraven on tombs; as, That of Alexander,

Sufficit huic tumulus, cui non sufficeret orbis;

and that of Newton,

*Isaacum Newton,
Quem immortalē
Testantur Tempus, Natura, Caelum,
Mortalem hoc marmor
Fateatur.*

EPITASIS, in ancient poetry, the second part or division of a dramatic poem, wherein the plot, entered upon in the first part or *protasis*, was carried on, heightened, and worked up, till it arrived at its state or height, called *catastasis*.

EPITASIS, in medicine, the increase of a disease or beginning of a paroxysm, particularly in a fever.

EPIHALAMIUM, in poetry, a nuptial song or composition

Epithem
||
Epoec.

composition in praise of the bride and bridegroom, praying for their prosperity, for a happy offspring, &c.

Epithalamia were sung amongst the Jews, at the door of the bride, by her friends and companions, the evening before the marriage. Psalm xlv. is an epithalamium. Among the Greeks the epithalamium was sung as soon as the married couple were gone to bed, and attended with shouts and stamping of the feet to drown the cries of the bride. They returned in the morning, and with the same song, a little altered, saluted them again. The evening song was called *πρωλαμια κοιμησης*, the morning salute was called *πρωλαμια γυμνασιας*. This was the practice amongst the Romans also, but their epithalamia were often obscene.

EPITHEM, in pharmacy, a kind of fomentation, or remedy of a spirituous or aromatic kind, applied externally to the regions of the heart, liver, &c. to strengthen and comfort the same, or to correct some intemperature thereof.

EPITHEM, in poetry and rhetoric, an adjective expressing some quality of a substantive to which it is joined; or such an adjective as is annexed to substantives by way of ornament and illustration, not to make up an essential part of the description. Nothing, says Aristotle, tires the reader more than too great a redundancy of epithets, or epithets placed improperly; and yet nothing is so essential in poetry as a proper use of them. The writings of the best poets are full of them.

EPITOME, in literary history, the same with **ABRIDGEMENT**.

EPITRITUS, in prosody, a foot consisting of three long syllables and one short. Of these, grammarians reckon four kinds: the first consisting of an iambus and spondee, as *salūtāntes*; the second, of a trocheus and spondee, as *conēctati*; the third, of a spondee and an iambus, as *commūnicāns*; and the fourth, of a spondee and trocheus, as *incantāre*. See the articles **SPONDEUS**, **TROCHEUS**, &c.

EPITROPE. See **ORATORY**, n° 83.

EPITROPUS, a kind of judge, or rather an arbitrator, which the Greek Christians under the dominion of the Turks elect in the several cities, to terminate the differences that arise among them, and avoid carrying them before the Turkish magistrates. See **ARBITRATOR**.

Antiently the Greeks used the term *επιτροπος* in the same sense as the Latins did *procurator*, viz. for a commissioner or intendant. Thus the commissioners of provisions in the Persian army are called by Herodotus and Xenophon *επιτροποι*. In the New Testament, *επιτροπος* denotes the steward of a household, rendered in the vulgar *procurator*.

EPIZEUXIS. See **ORATORY**, n° 68.

EPOCHA, in chronology, a term or fixed point of time whence the succeeding years are numbered or counted. See **ÆRA**.

EPODE, in lyric poetry, the third or last part of the ode, the ancient ode being divided into strophe, antistrophe, and epode. See **ODE**, &c.

The epode was sung by the priests, standing still before the altar, after all the turns and returns of the strophe and antistrophe, and was not confined to any precise number or kind of verses.

The epode is now a general name for all kinds of little verses that follow one or more great ones, of what

kind soever they be: and in this sense, a pentameter is an epode after an hexameter. And as every little verse, which, being put after another, closes the period, is called *epode*; hence the sixth book of Horace's odes is intitled *liber epodon*, "book of epodes," because the verses are all alternately long and short, and the short ones generally, though not always, close the sense of the long one.

EPOPOEIA, in poetry, the history, action, or fable, which makes the subject of an epic poem. The word is derived from the Greek *επος* *carmen*, "verse;" and *ποιω* *facio*, "I make."

In the common use of the word, however, *epopœia* is the same with *epos*, or epic poem itself. See the article **POETRY**.

EPOPS, or HOOPOE. See **URUPA**.

EPSOM, a town of Surry, about 16 miles south-west from London, long famous for its mineral waters. These were discovered in 1618; and though not in such repute as formerly, yet they are not impaired in virtue, and the salt * made from them is famous all over Europe, for gently cleansing and cooling the body. The hall, galleries, and other public apartments, are now run to decay; and there remains only one house on the spot, which is inhabited by a countryman and his wife, who carry the waters in bottles to the adjacent places, and supply the demands of dealers in London. On the neighbouring downs are annually horse-races; but the inns, shops, and bowling-greens are not near so much frequented as formerly. The market is on Friday; fair, July 25. The town is about one mile and an half in semicircle, from the church to the palace at Durdans, which was burnt down some years since, but has been rebuilt. It was once inhabited by his present majesty's father. In Hudson's Lane here was Epfom-Court, an ancient Saxon seat, long since converted into a farm. Here are so many fields, meadows, orchards, gardens, and the like, that a stranger would be at a loss to know whether this was a town built in a wood, or a wood surrounded by a town.

Epsom water is easily imitated by art; i. e. by only dissolving half an ounce of Epsom salt in a quart of pure water, made somewhat brisk or quick by a few drops of spirit of vitriol and oil of tartar, so as to let the alkali prevail.

EPUARES, in antiquity, an epithet given to those who were admitted to the sacred *epule* or entertainments, it being unlawful for any to be present at them who were not pure and chaste.

EPULO, in antiquity, the name of a minister of sacrifice among the Romans.

The pontifices, not being able to attend all the sacrifices performed at Rome to so many gods as were adored by that people, appointed three ministers, whom they called *epulones*, because they conferred on them the care and management of the *epula* feasts in the solemn games and festivals. To them belonged the ordering and serving the sacred banquet, offered on such occasions to Jupiter, &c. They wore a gown bordered with purple like the pontifices. Their number was at length augmented from three to seven, and afterwards by Cæsar to ten. Their first establishment was in the year of Rome 558, under the consulate of L. Furius Purpureo, and M. Claudius Marcellus.

EPULOM,

Epopœia
||
Epulo.

* See *Chr.-mistry* Index

Epulum
||
Equery.

EPULUM, in antiquity, a holy feast prepared for the gods in times of public danger. The feast was sumptuous, and the gods were formally invited and attended; for the statues were brought on rich beds furnished with soft pillows, called *pulvinaria*: Thus accommodated, their godships were placed on their couches at the most honourable part of the table. The care of the *epula* belonged to the *epulones*, and the gods were plentifully served with the richest dainties, as if they were able to eat; but the *epulones* performed that function for them, and doubtless were competent proxies! No wonder that Pliny solicited Trajan to be admitted of their order.

EPULUM is also used to signify any solemn feast; for we meet with *epulum ferale*, "a funeral entertainment."

EQUABLE, an appellation given to such motions as always continue the same in degree of velocity, without being either accelerated or retarded.

EQUAL, a term of relation between two or more things of the same magnitude, quantity, or quality.

Mathematicians speak of *equal* lines, angles, figures, circles, ratios, solids.

EQUALITY, that agreement between two or more things, whereby they are denominated equal.

EQUANIMITY, in ethics, denotes that even and calm frame of mind and temper, under good or bad fortune, whereby a man appears to be neither puffed up nor overjoyed with prosperity, nor dispirited, soured, or rendered uneasy by adversity.

EQUATIONS, in algebra. See **ALGEBRA**, chap. iii.

EQUATION of Time, in astronomy and chronology, the reduction of the apparent time or motion of the sun, to equable, mean, or true time. See **ASTRONOMY**, n° 383.

EQUATOR, or **ÆQUATOR**, in astronomy and geography, a great circle of the sphere, equally distant from the two poles of the world, or having the same poles with those of the world. It is called the *equator*, because when the sun is in it the days and nights are equal; whence also it is called the *equinoctial*; and when drawn on maps and planispheres, the *equinoctial line*, or simply the *line*. Every point of the equator is a quadrant's distance from the poles of the world; whence it follows, that the equator divides the sphere into two hemispheres, in one of which is the northern, and in the other the southern pole.

EQUATORIAL INSTRUMENT. See **ASTRONOMY**, n° 499, 504.

EQUERY, or **ECURY**, a grand stable or lodge for horses, furnished with all the conveniences thereof; as stalls, manger, rack, &c. The word is formed from the French *écurie*, which signifies the same thing. Some again derive *écurie* from the Latin *scuria*, which not only denotes a place for beasts to be put up in, but also a grange or barn. But a more probable derivation is from *equus* "a stable for horses," of *equus* "horse." Some hold that the word *stable*, in propriety, relates only to bullocks, cows, sheep, hogs, &c. and *equery*, to horses, mules, &c.

A *simple equery* is that provided for one row of horses; a *double equery* that provided for two, with a passage in the middle, or two passages; the horses being placed head to head, as in the little equery at Versailles.

Under equery are sometimes also comprehended the lodgings and apartments of the equerries, grooms, pages, &c.

EQUERY (*escuyer*), is also an officer who has the care and management of the horses of a king or prince.

EQUERIES, or **EQUERRIES**, popularly called *Querriers*, are particularly used among us for officers of the king's stables, under the master of the horse, seven in number, who, when his majesty goes abroad, ride in the leading coach, are in waiting one at a time monthly, and have a table with the gentlemen-ushers during the time, and a salary of L. 300 a-year each. They used to ride on horseback by the coach-side when the king travelled; but that being more expensive to them than necessary to the sovereign, it has been discontinued.

EQUERIES of the Crown Stable have that appellation, as being employed in managing and breaking the saddle-horses, and preparing them for the king's riding. There are two in number; the first having an annual salary of L. 256, and the second L. 200, whereof one is, or always should be, in close waiting at court; and when his majesty rides, holds the stirrup, while the master of the horse, or one of the equeries in his absence, assists in mounting him; and when his majesty rides, they usually attend him.

EQUES, in antiquity. See **EQUESTRIAN Order**, and **EQUITES**.

EQUES Auratus, is used to signify a knight-bachelor, called *auratus*, q. d. *gilt*, because anciently none but knights might gilt or beautify their armour or other habiliments of war with gold. In law this term is not used, but instead of it *miles*, and sometimes *chevalier*.

EQUESTRIA, among the Romans, a place in the theatre where the equites or knights fat.

EQUESTRIAN (*Equestria*), a term chiefly used in the phrase *equestrian statue*, which signifies a statue representing a person mounted on horseback. The word is formed of the Latin *eques*, "knight, horseman," of *equus*, "horse."

EQUESTRIAN Games, among the Romans, horse-races, of which there were five kinds, the *prodomus* or *plain horse-race*, the *chariot-race*, the *decursory-race* about funeral piles, the *ludi sevirales*, and the *ludi neptunales*.

EQUESTRIAN Order, among the Romans, signified their knights or equites; as also their troopers or horsemen in the field; the first of which orders stood in contradistinction to the senators; as the last did to the foot, military, or infantry. Each of these distinctions was introduced into the state by Romulus.

EQUIANGULAR, in geometry, an epithet given to figures whose angles are all equal: such are a square, an equilateral triangle, &c.

EQUIDISTANT, an appellation given to things placed at equal distances from some fixed point or place to which they are referred.

EQUILATERAL, in general, something that hath equal sides; as an equilateral triangle.

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang so exactly even and level, that neither doth ascend or descend, but both keep in a position parallel to the horizon; which is occasioned by their being both charged with an equal weight.

EQUIMULTIPLES,

Equeries
||
Equilibrium.

EQUIMULTIPLES, in arithmetic and geometry, are numbers or quantities multiplied by one and the same number or quantity. Hence, equimultiples are always in the same ratio to each other as the simple quantities before multiplication: thus, if 6 and 8 are multiplied by 4, the equimultiples 24 and 32 will be to each other as 6 to 8.

EQUINOCTIAL, or **ÆQUINOCTIAL**, in astronomy, a great and immovable circle of the sphere, under which the equator moves in its diurnal motion.

The equinoctial or equinoctial line, is ordinarily confounded with the equator: but there is a difference; the equator being moveable, and the equinoctial immovable; and the equator being drawn about the convex surface of the sphere, but the equinoctial on the concave surface of the magnus orbis.

Whenever the sun in his progress through the ecliptic comes to this circle, it makes equal days and nights all around the globe; as then rising due east and setting due west, which he never does at any other time of the year. And hence the denomination from *aquæ* and *nox*, "night," *quia æquat diem nocti*.

The equinoctial then is the circle which the sun describes, or appears to describe, at the time of the equinoxes; that is, when the length of the day is every where equal to that of night, which happens twice a year. See **EQUINOX**.

EQUINOCTIAL, in geography. See **EQUATOR**.

The shadows of those who live under this circle are cast to the southward of them for one half of the year, and to the northward of them during the other half; and twice in a year, *viz.* at the equinoxes, the sun at noon casts no shadow, being in their zenith.

From this circle is the declination or latitude of places accounted in the degrees of the meridian.

EQUINOCTIAL Points, are the two points wherein the equator and ecliptic intersect each other: the one being in the first point of Aries, is called the *vernal point* or *equinox*; and the other in the first point of Libra, the *autumnal point* or *equinox*.

EQUINOCTIAL Dial, is that whose plane lies parallel to the equinoctial. See **DIAL**.

EQUINOX, or **ÆQUINOX**, in astronomy, the time when the sun enters one of the equinoctial points.

The equinoxes happen when the sun is in the equinoctial circle; when of consequence the days are equal to the nights throughout the world, which is the case twice a year, *viz.* about the 20th of March and the 23d of September, the first of which is the vernal and the second the autumnal equinox.

It is found by observation, that the equinoctial points, and all the other points of the ecliptic, are continually moving backward, or in *antecedentia*, that is, westward. This retrograde motion of the equinoctial points, is that famous and difficult phenomenon called the *precession of the equinoxes*. See **ASTRONOMY**, no 348, 349.

EQUIPAGE, in the military art, denotes all sorts of utensils, artillery, &c. necessary for commencing and prosecuting with ease and success any military operations. Camp and field equipage consists of tents, kitchen-furniture, saddle-horses, baggage, waggons, bat-horses, &c.

To **EQUIP**, in naval language, a term borrowed from the French marine, and frequently applied to the

business of fitting a ship for sea, or arming her for war.

EQUIPOLLENCE, in logic, is when there is an equivalence between any two or more terms or propositions; *i. e.* when they signify one and the same thing, though they express it differently. Such propositions, &c. are said to be *equipollent*.

EQUIRIA, in antiquity, a festival instituted by Romulus, and celebrated on the 27th of February, in honour of Mars, at which there were horse-races.

EQUISETUM, **HORSE-TAIL**: A genus of the order of filices, belonging to the cryptogamia class of plants; and in the natural method ranking under the 51st order, *Conifera*. There is a spike of peltated or shielded fructifications opening at the base. There are seven species; of which the most remarkable are, 1. The sylvaticum, or wood horse-tail. It grows in woods and moist shady places in many parts of England and Scotland. The stalk rises from 12 to 18 inches high, angular, and rough to the touch; the angles being edged with sharp *spicules*, scarce visible without a microscope. The leaves grow verticillate, 12 or more in a whorl, and these whorls are about an inch distant from one another. The leaves are very slender, nearly quadrangular, about five inches long, pendent, and beset with several other secondary whorls, so that it resembles a pine-tree in miniature. Horses are very fond of this plant, and in some parts of Sweden it is collected to serve them as winter food. 2. The arvense, common or corn horse-tail, grows in wet meadows and corn-fields. The most remarkable property of this is, that its seeds, when viewed by a microscope, are seen to leap about as if they were animated. It has a very astringent and diuretic quality, and has been esteemed serviceable in the *hematuria* and *gonorrhœa*, but is disregarded by the present practice. It is a troublesome plant in pastures; and disagreeable to cows, being never touched by them unless they are compelled by hunger, and then it brings on an incurable diarrhœa. It does not seem to affect horses or sheep. 3. The palustre, marsh horse-tail, or paddock pipe, is frequent in marshes and ditches. It is not so rough as the former, but is likewise prejudicial to cattle. 4. The fluviale, or great river horse-tail, is frequent in shady marshes, and on the banks of stagnant waters. It is the largest of all the species, growing sometimes to the height of a yard, and near an inch in diameter. Haller tells us, that this kind of equisetum was eaten by the Romans; and Linnaeus affirms, that oxen and rein-deer are fond of it, but that horses refuse it. 5. The hyemale, rough horse-tail, shave-grass, or Dutch rush. This is much used by the whitelime and cabinet-makers, under the name of *Dutch rushes*, for polishing their metals and wood. All the other species will answer this purpose in some degree, but the last better than any of the rest. In Northumberland the dairy-maids scour and clean their milk-pails with it. Some imagine, that if cows are fed with this species, their teeth will fall out.

EQUITES, amongst the Romans, were persons of the second degree of nobility, immediately succeeding the senators in point of rank. The *equites* or knights were required to be possessed of 400 *asferia* before they could be admitted into that order; and when the knights were so reduced as to fall short of the pre-

scribed

Horse.



Zebra.

Ass.



Abel Pin. Wat. Sculptor fecit.

Equiv. subscribed revenue, they were expunged out of the eque-
ivalent. strian list. The equestrian revenue just mentioned a-
 mounted to about 10,000 crowns.

Part of the ceremony whereby the honour of knight-
 hood was conferred amongst the Romans was the giving of a horse for every *equus* or knight had a horse kept at the public charge, he received also the stipend of an horseman to serve in the wars, and wore a ring which was given him by the state. The *equites* composed a large body of men, and constituted the Roman cavalry; for there was always a sufficient number of them in the city, and nothing but a review was requisite to fit them for service.

The knights at last grew too powerful, were a balance for the senate and people, neglected the exercises of war, and betook themselves to civil employments. The *equites* were liable to be punished by the censors, and to suffer degradation. They were degraded by taking from them the horse which was kept for each of them at the public charge; this was called *equum adimere*.

EQUITY, in a general sense, the virtue of treating all other men according to reason and justice, or as we would gladly be treated ourselves when we understand right what is our due. See JUSTICE.

EQUITY, in jurisprudence, is defined a correction or qualification of the law, generally made in that part wherein it falleth or is too severe. It likewise signifies the extension of the words of the law to cases unexpressed, yet having the same reason; so that where one thing is enacted by statute, all other things are enacted that are of the like degree. For example, the statute of *Glouc.* gives action of waste against him that holds lands for life or years; and by the equity thereof, a man shall have action of waste against a tenant that holds but for one year, or one half-year, which is without the words of the act, but within the meaning of it; and the words that enact the one, by *equity* enact the other. So that equity is of two kinds. The one abridges and takes from the letter of the law: the other enlarges and adds to it; and statutes may be construed according to equity, especially where they give remedy for wrong, or are for expedition of justice. Equity seems to be the interposing *law of reason*, exercised by the lord chancellor in extraordinary matters to do equal justice; and by supplying the defects of the law, gives remedy in all cases. See CHANCERY.

EQUITY, in mythology, sometimes confounded with *Justice*, a goddess among the Greeks and Romans, represented with a sword in one hand and a balance in the other.

EQUIVALENT, is understood of something that is equal in value, force, or effect, to another.

Equivalence is of various kinds, in propositions, in terms, and in things.

Equivalent Propositions. See EQUIPOLLENCE.

Equivalent Terms are where several words that differ in sound have yet one and the same signification; as every body was there, and nobody was absent, *nihil enim, and omne*.

Equivalent Things, are either moral, physical, or spiritual. Moral, as when we say that the commanding or advising a murder is a guilt equivalent to that of the murderer. Physical, as when a man who has the strength

of two men is said to be equivalent to two men. *Sic Equival*
tial, whereby a less weight becomes of equal force with a greater, by having its distance from the centre increased.

EQUIVOCAL TERMS OF WORDS, among logicians, are those which have a doubtful or double meaning.

According to Mr Locke, the doubtfulness and uncertainty of words has its cause more in the ideas themselves, than in any incapacity of the words to signify them; and might be avoided, would people always use the same term to denote the same idea or collection of ideas: but, adds he, it is hard to find a discourse on any subject where this is the case; a practice which can only be imputed to folly or great dishonesty; since a man, in making up his accounts, might with as much fairness use the numeral characters sometimes for one sometimes for another collection of units.

Equivocal Generation, the production of animals without the intercourse between the sexes, by the influence of the sun or stars, &c.

This kind of generation is now quite exploded by the learned.

EQUIVOCATION, the using a term or expression that has a double signification. Equivocations are expedients to save telling the truth, and yet without telling a falsity. The fathers are great patrons of equivocations and mental reservations, holding that the use of such shifts and ambiguities is in many cases allowable.

EQUULEUS, or ECCULEUS, in antiquity, a kind of rack used for extorting a confession, at first chiefly practised on slaves, but afterwards made use of against the Christians.

The equuleus was made of wood, having holes at certain distances, with a screw, by which the criminal was stretched to the third, sometimes to the fourth, or fifth holes, his arms and legs being fastened on the equuleus with cords; and thus was hoisted aloft, and extended in such a manner, that all his bones were dislocated. In this state red-hot plates were applied to his body, and he was goaded in the sides with an instrument called *ungula*.

EQUULEUS, *Equiculus*, and *Equus Minor*, the horse's head, in astronomy, a constellation of the northern hemisphere, whose stars in Ptolemy's catalogue are 45 in Tycho's 45, in Hevelius's 6, and in Mr Flamsteed's 10.

EQUUS, in zoology, a genus of quadrupeds belonging to the order of *belluæ*. This genus comprehends the horse, the mule, the ass, the zebra, and the quagga: they have six erect and parallel fore-teeth in the upper jaw, and six somewhat prominent ones in the under jaw; the dog-teeth are solitary, and at a considerable distance from the rest; and the feet consist of an undivided hoof.

1. The *caballus*, or HORSE, has a long flowing mane, and the tail covered on all parts with long hairs.

The horse, in a domestic state, is a bold and fiery animal; equally intrepid as his master, he faces danger and death with ardour and magnanimity. He delights in the noise and tumult of arms, and seems to feel the glory of victory: he exalts in the chase; his eyes sparkle with emulation in the course. But though bold and intrepid, he is docile and tractable: he knows how to govern

govern and check the natural vivacity and fire of his temper. He not only yields to the hand, but seems to consult the inclination of his rider. Constantly obedient to the impressions he receives, his motions are entirely regulated by the will of his master. He in some measure resigns his very exultance to the pleasure of man. He delivers up his whole powers; he reserves nothing; he will rather die than disobey. Who could endure to see a character so noble abused! who could be guilty of such gross barbarity!

This character, though natural to the animal, is in some measure the effect of education. His education commences with the loss of liberty, and is finished by constraint. The slavery of the horse is so ancient and so universal, that he is but rarely seen in a natural state. Several ancient writers talk of wild horses, and even mention the places where they were to be found. Herodotus takes notice of white savage horses in Scythia; Aristotle says they are to be found in Syria; Pliny, in the northern regions; and Strabo, in Spain and the Alps. Among the moderns, Cardan says, that wild horses are to be found in the Highlands of Scotland and the Orkney isles; Olaus, in Muscovy; Dapper, in the island of Cyprus; Leo and Marmol, in Arabia and Africa, &c. But as Europe is almost equally inhabited, wild horses are not to be met with in any part of it: and those of America were originally transported from Europe by the Spaniards; for this species of animals did not exist in the new world. The Spaniards carried over a great number of horses, left them in different islands, &c. with a view to propagate that useful animal in their colonies. These have multiplied incredibly in the vast deserts of those thinly peopled countries, where they roam at large, without any restraint. M. de Salle relates, that he saw, in the year 1685, horses feeding in the meadows of North America, near the bay of St Louis, which were so ferocious that nobody durst come near them. Oexmelin says, that he has seen large troops of them in St Domingo running in the valleys: that when any person approached, they all stopped; and one of them would advance till within a certain distance, then snort with his nose, take to his heels, and the whole troop after him. Every author who takes notice of these horses of America, agree that they are smaller and less handsome than those of Europe. These relations sufficiently prove, that the horse, when at full liberty, though not a fierce or dangerous animal, has no inclination to associate with mankind; that all the softness and ductility of his temper proceeds entirely from the culture and polish he receives in his domestic education, which in some measure commences as soon as he is brought forth.

The motions of the horse are chiefly regulated by the bit and the spur; the bit informs him how to direct his course, and the spur quickens his pace. The mouth of the horse is endowed with an amazing sensibility: the slightest motion or pressure of the bit gives him warning, and instantly determines his course.

The horse has not only a grandeur in his general appearance, but there is the greatest symmetry and proportion in the different parts of his body. The regularity and proportion of the different parts of the head gives him an air of lightness, which is well supported by the strength and beauty of his chest. He erects his head, as if willing to exalt himself above the condition

of other quadrupeds: his eyes are open and lively; his ears are handsome, and of a proper height; his mane adorns his neck, and gives him the appearance of strength and boldness.

At the age of two years, or two years and a half, the horse is in a condition to propagate; and the mare, like most other females, is ready to receive him still sooner. But the foals produced by such early embraces are generally ill-made and weakly. The horse should never be admitted to the mare till he is four or four and a half; this is only meant with regard to draught-horses. Fine horses should not be admitted to the mare before they be six years old; and Spanish stallions not till seven. The mares are generally in season from the beginning of April to the end of June; but their chief ardour for the horse lasts but about 15 or 20 days, and this critical season should always be embraced. The stallion ought to be found, well made, vigorous, and of a good breed. For fine saddle-horses, foreign stallions, as Arabians, Turks, Barbs, and Andalusians, are preferable to all others. Next to these, British stallions are the best; because they originally sprang from those above-mentioned, and are very little degenerated. The stallions of Italy, and especially the Neapolitans, are very good. The best stallions for draught or carriage horses, are those of Naples, Denmark, Holstein, and Freezeland. The stallions for saddle-horses should be from 14 to 15 hands high, and for draught horses at least 15 hands. Neither ought the colour of stallions to be overlooked; as a fine black, grey, bay, sorrel, &c. Besides these external qualities, a stallion ought to have courage, tractability, spirit, agility, a sensible mouth, sure limbs, &c. These precautions in the choice of a stallion are the more necessary, because he has been found by experience to communicate to his offspring almost all his good or bad qualities, whether natural or acquired.

The mare contributes less to the beauty of her offspring than the stallion; but she contributes perhaps more to their constitution and stature: for these reasons, it is necessary that the mares for breed be perfectly found, and make good nurses. For elegant horses, the Spanish and Italian mares are best; but for draught-horses, those of Britain and Normandy are preferable. However, when the stallions are good, the mares of any country will produce fine horses, provided they be well made and of a good breed.

Mares go with young 11 months and some days. They bring forth standing: contrary to the course of most other quadrupeds, who lie during this operation. They continue to bring forth till the age of 16 or 18 years; and both horses and mares live between 25 and 30 years. Horses cast their hair once a-year, generally in the spring, but sometimes in the autumn. At this time they are weak, and require to be better fed and taken care of than at any other season.

In Persia, Arabia, and most eastern countries, they never geld their horses, as is done in Europe and China. This operation greatly diminishes their strength, courage, and spirit; but it makes them good humoured, gentle, and tractable. With regard to the time of performing this operation, the practice of different countries is different: some geld their horses when a year old, and others at 18 months. But the best and most general practice is to delay the operation till they

be two years old at least: because, when the gelding is delayed for two years or more, the animals retain more of the strength and other qualities which naturally belong to the male.

As the utility of horses surpasses that of all other domestic animals, it may be of use to subjoin some marks by which the age and other properties of horses may be distinguished.

In old horses, the eye-pits are generally deep; but this is only an equivocal mark, being also found in young horses begot by old stallions. The most certain knowledge of the age is to be obtained from the teeth. Of these a horse has 40; 24 grinders or double-teeth, four tusches, and 12 fore-teeth: mares have no tusches, or at least very short ones. It is not from the grinders that we know the age; it is discovered first by the fore-teeth, and afterwards by the tusches. The 12 fore-teeth begin to shoot within 12 days after the colt is foaled. These first, or foal-teeth, are round, short, not very solid, and are cast at different times, to be replaced by others. At the age of two years and a half, the four middle fore-teeth are cast, two in the upper jaw, and two in the lower. In one year more, four others drop out, one on each side of the former, which are already replaced. When he is about four years and a half old, he sheds four others, and always next to those which have fallen out and been replaced. These four foal-teeth are replaced by four others, but are far from growing so fast as those which replaced the eight former, and are called the *corner-teeth*; they replace the four last foal-teeth, and by these the age of a horse is discovered. They are easily known, being the third both above and below, counting from the middle of the jaw. They are hollow, and have a black mark in their cavity. When the horse is four years and a half old, they are scarce visible above the gum, and the cavity is very sensible: at six and a half, they begin to fill; and the mark continually diminishes and contracts till seven or eight years, when the cavity is quite filled up, and the black spot effaced. After eight years, these teeth ceasing to afford any knowledge of the age, it is judged of by the tusches: which are four teeth adjoining to those last mentioned; and, like the grinders, are not preceded by any other teeth. The two in the lower jaw usually begin to shoot at three years and a half, and those of the upper jaw at four; continuing very sharp-pointed till six. At 10, the upper seem blunted, worn out, and long, the gum contracting itself as its years increase; the barer therefore they are, the older is the horse. From 10 to 13 or 14 years, little can be seen to indicate the age; but at that time some hairs of the eye-brows begin to turn grey. This mark, however, is equivocal, like that drawn from the depth of the eye-pits; horses from old stallions or mares, having grey hairs in the eye-brows when they are not above nine or ten years old. In some horses the teeth are of such a hardness as not to wear; and in such the black mark always subsists, being never effaced by time: but the age of these horses, which are called *leguts* by the French, is easily known; the hollow of the tooth being filled up, and at the same time the tusches very long. It has been farther observed, that this is more common in mares than in horses. The age of a horse may be also known, though less accu-

rately, by the bars in his mouth, which wear away as he advances in years.

When the horse is without blemish, the legs and thighs are clean, the knees straight, the skin and flank thin, and the back-flesh strong and well-braced. The sinews and the bones should be so distinct, as to make the legs appear thin and lathy, not full and round. The pastern joints should never be large and round; nor must there be any swelling near the coronet. The hock should be lean and dry, not puffed up with wind. With regard to the hoof, the coronet should be equally thick, and the horn shining and greyish. A white horn is a sign of a bad foot, for it will wear out in a short time; and likewise when the horn is thin, it is liable to be spoiled in shoeing, and by travelling hard on stony grounds. This is best known when the shoe is taken off; for then the verge all round the sole will appear thin, and the horse will wince at the least touch of the pincers.

A strong foot has the fibres of the hoof very distinct running in a direct line from the coronet to the toe, like the grain of wood. In this case, care must be taken to keep the foot moist and pliable. The greatest inconvenience attending a hard strong foot, is its being subject to rifts and fissures, which cleave the hoof quite through sometimes from the coronet down to the bottom.

A narrow heel is likewise a defect; and when it is not above two fingers in breadth, the foot is bad. A high heel causes a horse to trip and stumble often; and the low one, with long yielding pasterns, is very apt to be worn quite away on a journey. Too large a foot in proportion to the rest of the body, renders a horse weak and heavy.

The head of a horse should be small, and rather lean than fleshy. The ears should be small, erect, thin, sprightly, and pointed. The forehead, or brow, should be neither too broad nor too flat, and should have a star or snip thereon. The nose should rise a little, and the nostrils should be wide that he may breathe more freely. The muzzle should be small, and the mouth neither too deep nor too shallow. The jaws should be thin, and not approach too near together at the throat, nor too high upwards towards the onset, that the horse may have sufficient room to carry his head in an easy graceful posture. The eyes should be of a middle size, bright, lively, and full of fire. The tongue should be small, that it may not be too much pressed by the bit; and it is a good sign when his mouth is full of white froth, for it shows that he will not soon be overheated.

The neck should be arched towards the middle, growing smaller by degrees from the breast and shoulders to the head. The hair of the main should be long, small, and fine; and if it be a little frizzled, so much the better. The shoulders should be pretty long; the withers thin, and enlarge gradually from thence downwards; but so as to render his breast neither too narrow nor too gross. A thick-shouldered horse soon tires, and trips and stumbles every minute; especially if he has a thick large neck at the same time. When the breast is so narrow that the fore-thighs almost touch, they are never good for much. A horse of a middle size should have the distance of five or six inches

between his fore-thighs, and there should be less distance between his feet than his thighs near the shoulders when he stands upright.

The body or carcase of a horse should be of a middling size in proportion to his bulk, and the back should sink a little below the withers; but the other parts should be straight, and no higher behind than before. He should also be home ribbed; but the short ribs should not approach too near the haunches, and then he will have room to fetch his breath. When a horse's back is short in proportion to his bulk, and yet otherwise well limbed, he will hold out a journey, tho' he will travel slow. When he is tall, at the same time with very long legs, he is but of little value.

The wind should never be overlooked in the choice of a horse: and it may easily be known by his flanks, if he is broken-winded, when he stands quiet in the stable; because he always pinches them in with a very slow motion, and drops them suddenly. A thick-winded horse fetches his breath often, and sometimes rattles and wheezes. This may be always discovered when he is put to brisk exercises.

The temper of a horse should always be observed; a vicious horse generally lays his ears close to his pole, shows the whites of his eyes, and looks sullen and dogged. An angry horse may be known by his frowning looks; and he generally seems to stand in a posture of defence. When he is very vicious, he pays no regard to the groom that feeds him: However, some horses that are ticklish will lay back their ears, and yet be of a good disposition. A fearful horse is apt to start, and never leaves it off till he is old and useless. A fretful horse is very unfit for a journey; and you may discover his temper as soon as he gets out of the stable. A dull, heavy, sluggish horse may be easily known, whatever tricks are used to rouse his spirits.

With regard to the colour of a horse, the bright bay, and indeed all kinds of bays in general, are accounted good colours. The chestnut horse is generally preferable to the sorrel, unless the former happens to be bald, or party-coloured, with white legs. Brown horses have generally black manes and tails, and their joints are of a rusty black. Those of this colour that are dappled, are much handsomer than the rest. Horses of a shining black, and well marked without too much white, are in high esteem for their beauty. A star, or blaze, or white muzzle, or one or more feet tipped with white, are thought to be rather better than those that are quite black.

Of greys, the dappled are accounted best; though the silver grey make a more beautiful appearance, and often prove good. The iron grey with white manes and tails are thought not to be so hardy. Greys of every kind will turn white sooner or later; but the nutmeg grey, when the dappled parts incline to bay or chestnut, are said to be good hardy horses. Roan horses have a diversity of colours mixed together; but the white is more predominant than the rest. They are all generally hardy, and fit for the road; and some are exceeding good. Those of a strawberry colour most resemble the sorrel, and they are often marked with white on the face and legs. When the bay is blended with it, he seems to be tinged with claret; and some of these prove to be very good. Dun, fallow, and

cream-coloured horses have a hit down their backs; and their manes and tails are black. Dun horses are seldom chosen by gentlemen, and yet they may be very useful to the country farmer. The fallow and cream-coloured are more esteemed, both for beauty and use. Those horses that are finely spotted with gay colours like leopards are a great rarity, and for that reason are only in the hands of great men.

There is some difference in horses according to the different countries where they are bred. For instance, in France, those of Bretagne are pretty strong made, and have generally black hair, or brown bays; and they have good legs and feet, with a hardy mouth, and a head short and fleshy; but in general they are pretty clumsy. The horses of Franche Comté are said to have the legs of tigers, and the belly of a hind; but they are short and thick, and of a middle size; being much more proper for drawing than riding. The horses of Gascony are not unlike those of Spain; but they are not so handsome nor so active, and therefore they are more proper to draw carriages. The Limousin horses are very vicious, and are good for little till they are six years old. Their colour is generally bay, or a bay brown. The horses of Normandy are much like those of Bretagne; and those of Poitou have good bodies, legs, feet, and eyes; but they are far from being handsome.

The horses of Germany are much better and more handsome than those of the Low Countries. They are of great use for carriages; but much more for the army, and for drawing the artillery. They have a great deal of hair, especially about the legs. They are not large, but they are well set; and yet they have tender feet. The Hungarian horses are excellent for the coach, as well as for riding; but they are large, though well proportioned; and they are of all colours, and in general very swift.

The Danish horses are low, short, and square; but they have a fine head, and short hair. The horses of the Low Countries are very fit for the coach, and they are best known by the name of *Flanders-mares*. The Polish horses are like the Danish; only they have not so fine a fore-hand: their colour is generally a bright bay, and that of the outward peel of an onion; and they are fiery and vicious. The horses of Switzerland are pretty much like those of Germany; which is no wonder, since the Germans purchase a great number of them. The horses of Piedmont are fiery, of a middle size, and of all sorts of colours; their legs are good and handsome, their eyes fine, their ears small, and their mouth good; but they do not carry their heads well.

The horses of Naples and Italy are generally ill-made and lean; and yet they are good and useful, for they are light and proper for racing, though not for a long course; they never do well in a colder climate. The Spanish horses are very well made and handsome, as well as very active and nimble; they have good eyes, handsome legs and heads, and are easily managed; they are also good for racing, if they are well kept: however, they are not so good in northern climates as in their own country. The Turkish horses are of different shapes; but they are generally swift, tho' their mouths are bad. Most of them are white; tho' there

there are other colours; and they are large, hardy, strong, and fit for the road.

The horses of Barbary, commonly called *barbs*, have strong hoofs, and are more proper for racing than any others whatever: some have said they never grow old, because they preserve their vigour to the last. They are excellent stallions; and some of them are used as such in Britain: however, the Arabian horses are not quite so good as the Barbary, though some think they are both of the same kind; only those that are used to the deserts of Arabia are always in action. The horses of the Gold Coast of Guinea are very few in number, and in other parts of that coast there are none at all; for many of the negroes, when they have been first brought over to our American plantations, have expressed great admiration at the sight of a horse, and even been afraid to come near one.

The horses of the Cape of Good Hope were originally brought from Persia: and they are generally small, and of a chestnut colour; for those that are natives of that country are all wild, and could never yet be tamed. The horses of China are good, and more particularly those in the province of Yun Nan; for they are very vigorous, though a little low. The horses of the Eluth Tartars are good and full of fire; and their size is much the same as the Polish horses: they are afraid of nothing; not even of lions and tigers: but perhaps this may be owing to use. In the country of the Mogul they are very numerous, and of all colours: they are generally of the middle size, though there are some as large and as handsome as those in Europe. The wild horses of Tartary differ very little from the tame; but they are so swift, that they avoid the arrows of the most skillful hunters.

The breed of horses in Great Britain is as mixed as that of its inhabitants: the frequent introduction of foreign breeds has given us a variety that no single country can boast of: most other countries produce only one kind; while ours, by a judicious mixture of the several species, by the happy difference of our soils, and by our superior skill in management, may triumph over the rest of Europe, in having brought each quality of this noble animal to the highest perfection.

In the annals of Newmarket may be found instances of horses that have literally outstripped the wind, as the celebrated M. Condamine has lately shown in his remarks on those of Great Britain. Childers is an amazing instance of rapidity; his speed having been more than once exerted equal to $82\frac{1}{2}$ feet in a second, or near a mile in a minute.

The species used in hunting, is a happy combination of the former with others superior in strength, but inferior in point of speed and lineage: an union of both is necessary; for the fatigues of the chase must be supported by the spirit of the one, as well as by the vigour of the other.

No country can bring a parallel to the strength and size of our horses destined for the draught; or to the activity and strength united of those that form our cavalry. In London, there are instances of single horses that are able to draw on a plain, for a small space, the weight of three tons; but could with ease, and for a continuance, draw half that weight. The pack-horses of Yorkshire, employed in conveying the manufactures

of that country to the most remote parts of the kingdom, usually carry a burden of 420 pounds; and that indifferently over the highest hills of the north, as well as the most level roads. But the most remarkable proof of the strength of our British horses, is to be drawn from that of our mill horses: some of these will carry at one load 14 measures, which at a moderate computation of 70 pounds each, will amount to 980; a weight superior to that which the lesser sort of camels will bear: this will appear less surprising, as these horses are by degrees accustomed to the weight; and the distance they travel no greater than to and from the adjacent hamlets.

Our cavalry, in the late campaigns (when they had opportunity), showed over those of our allies, as well as of the French, a great superiority both of strength and activity: the enemy was broken through by the impetuous charge of our squadrons; while the German horses, from their great weight and inactive make, were unable to second our efforts; though those troops were actuated by the noblest ardour.

The present cavalry of this island only supports its ancient glory. It was eminent in the earliest times: our scythed chariots, and the activity and good discipline of our horses, even struck terror into Caesar's legions: and the Britons, as soon as they became civilized enough to coin, took care to represent on their money the animal for which they were so celebrated. It is now impossible to trace out this species; for those which exist among the *indigènes* of Great Britain, such as the little horses of Wales and Cornwall, the hobbies of Ireland, and the shielies of Scotland, though admirably well adapted to the uses of those countries, could never have been equal to the work of war: but probably we had even then a larger and stronger breed in the more fertile and luxuriant parts of the island. Those we employ for that purpose, or for the draught, are an offspring of the German or Flemish breed, meliorated by our soil and a judicious culture.

The English were ever attentive to an exact culture of these animals; and in very early times set a high value on their breed. The esteem that our horses were held in by foreigners so long ago as the reign of Athelstan, may be collected from a law of that monarch, prohibiting their exportation, except they were designed as presents. These must have been the native kind, or the prohibition would have been needless; for our commerce was at that time too limited to receive improvement from any but the German kind, to which country their own breed could be of no value. But when our intercourse with the other parts of Europe was enlarged, we soon laid hold of the advantages this gave of improving our breed. Roger de Boleme, earl of Shrewsbury, is the first that is on record: he introduced the Spanish stallions into his estate in Powisland, from which that part of Wales was for many ages celebrated for a swift and generous race of horses. Giraldus Cambrensis, who lived in the reign of Hen. II. takes notice of it; and Michael Drayton, cotemporary with Shakespeare, sings their excellence in the sixth part of his Polyolbion. This kind was probably destined to mount our gallant nobility, or courteous knights for feats of chivalry, in the generous contests of the tilt-yard. From these sprung, to speak the language of the times, the flower of couriers, whose elegant form added

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charms to the rider, and whose activity and managed dexterity gained him the palm in that field of gallantry and romantic honour.

The increase of our inhabitants, and the extent of our manufactures, together with the former neglect of internal navigation to convey those manufactures, multiplied the number of our horses: an excess of wealth, before unknown in these islands, increased the luxury of carriages, and added to the necessity of an extraordinary culture of these animals: their high reputation abroad has also made them a branch of commerce, and proved another cause of their vast increase.

The all-wise Creator hath finely limited the several services of domestic animals towards the human race; and ordered that the parts of such, which in their lives have been the most useful, should after death contribute the least to our benefit. The chief use that the *exuvie* of the horse can be applied to, is for collars, traces, and other parts of the harness; and thus, even after death, he preserves some analogy with his former employ. The hair of the mane is of use in making wigs; of the tail, in making the bottoms of chairs, floor-cloths, and chords; and to the angler in making lines.

Plate
CLXXXIII.

TECHNICAL DESCRIPTION of the Parts of a Horse.

The Fore Part. 1. The forehead. 2. The temples.

3. Cavity above the eye. 4. The jaw. 5. The lips.

6. The nostrils. 7. The tip of the nose. 8. The chin.

9. The beard. 10. The neck. 11. The mane. 12. The

fore-top. 13. The throat. 14. The withers. 15. The

shoulders. 16. The chest. 17. The elbow. 18. The

arm. 19. The plate vein. 20. The chestnut. 21. The

knee. 22. The flank. 23. The main tendons.

24. The fetlock joint. 25. The fetlock. 26. The

pastern. 27. The coronet. 28. The hoof. 29. The

quarters. 30. The toe. 31. The heel.—*The Body.*

32. The reins. 33. The filets. 34. The ribs.

35. The belly. 36. The flanks.—*The Hind Part.*

37. The rump. 38. The tail. 39. The buttocks.

40. The haunches. 41. The risle. 42. The thighs.

43. The hock. 44. The kerb. 45. The point of

the hock.

For the breeding, rearing, &c. of horses, see the articles, COLT, HORSE, and STALLION; for the method of training and managing them, see HORSEMANSHIP; and for their diseases and cure, see FARRIERY.

2. The *Assinus*, or *Ass*, has long slouching ears, short mane, tail covered with long hairs at the end. The body is usually of an ash colour, with a black bar across the shoulders.

The *Koulan*, or ass in a wild state (the *onager* of the ancients), varies from the tame in several respects, and requires a more particular description. The forehead is very much arched: the ears are erect, even when the animal is out of order; sharp-pointed, and lined with whitish curling hairs; the irides are of a livid brown; the lips thick; and the end of the nose sloping steeply down to the upper lip: the nostrils are large and oval. It is much higher on its limbs than the tame ass, and its legs are much finer, but it again resembles it in the narrowness of its chest and body: it carries its head much higher; and its skull is of a surprising thinness. The mane is dusky, about three or four inches long, compo-

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sed of soft woolly hair, and extends quite to the shoulders: the hairs at the end of the tail are coarse, and about a span long. The colour of the hair in general is a silvery white; the upper part of the face, the sides of the neck and body, are of a flaxen colour; the hind part of the thighs are the same; the fore part divided from the flank by a white line, which extends round the rump to the tail: the belly and legs are also white: along the very top of the back, from the mane quite to the tail, runs a stripe of bushy waved hairs of a coffee-colour, broadest above the hind part, growing narrower again towards the tail; another of the same colour crosses it at the shoulders (of the males only), forming a mark, such as distinguishes the tame asses: the dorsal band and the mane are bounded on each side by a beautiful line of white, well described by Oppian, who gives an admirable account of the whole. Its winter coat is very fine, soft, and silky, much undulated, and likest to the hair of the camel; greasy to the touch: and the flaxen colour, during that season, more exquisitely bright. Its summer coat is very smooth, silky, and even, with exception of certain shaded rays that mark the sides of the neck, pointing downwards.

These animals inhabit the dry and mountainous parts of the deserts of Great Tartary, but not higher than lat. 48. They are migratory, and arrive in vast troops to feed, during the summer, in the tracts east and north of lake Aral. About autumn they collect in herds of hundreds, and even thousands, and direct their course towards the north of India, to enjoy a warm retreat during winter. But Persia is their most usual place of retirement: where they are found in the mountains of Casbin, some even at all times of the year. If we can depend on Barboga, they penetrate even into the southern parts of India, to the mountains of Malabar and Golconda. According to Leo Africanus, wild asses of an ash colour are found in the deserts of northern Africa. The Arabs take them in snares for the sake of their flesh. If fresh killed, it is hot and unfavourable: if kept two days after it is boiled, it becomes excellent meat. These people, the Tartars and Romans, agreed in their preference of this to any other food: the latter indeed chose them young, at a period of life in which it was called *Lalifo*; (vide *Marini*. xiii. 97.) The epicures of Rome preferred those of Africa to all others. The grown *onagri* were introduced among the spectacles of the theatre; and their combats were preferred even to those of the elephants.

The manners of the wild ass are very much the same with those of the wild horse and the *dshikketei*. They assemble in troops under the conduct of a leader; and are very shy. They will, however, stop in the midst of their course, and even suffer the approach of man at that instant, but will then dart away with the rapidity of an arrow dismissed from the bow. This Herodotus speaks to, in his account of those of Mesopotamia; and Leo Africanus, in that of the African.

They are extremely wild. Holy writ is full of allusions to their savage nature. "He scorneth the multitude of the city, neither regardeth he the crying of the driver," (Job xxxix. 7.) Yet they are not untameable. The Persians catch and break them for the draught: they make pits, half-filled with plants to lessen the fall, and take them alive. They break, and

hold them in great esteem, and sell them at a high price. The famous breed of asses in the east is produced from the koulan reclaimed from the savage state, which highly improves the breed. The Romans reckoned the breed of asses produced from the onager and tame ass to excel all others. The Tartars, who kill them only for the sake of the flesh and skins, lie in ambush and shoot them. They have been at all times celebrated for their amazing swiftness; for which reason the Hebrews called them *Pere*; as they styled them *Arod* from their braying. Their food is the saltiest plants of the deserts, such as the kalis, atriplex, chenopodium, &c.; and also the bitter milky tribe of herbs: they also prefer salt-water to fresh. This is exactly conformable to the history given of this animal in the book of Job; for the words "barren land", expressive of its dwelling, ought, according to the learned Bochart, to be rendered "salt places." The hunters lie in wait for them near the ponds of brackish water, to which they resort to drink: but they are not of a thirsty nature, and seldom have recourse to water. These animals were anciently found in the Holy Land, Syria, the land of Uz or Arabia Deserta, Mesopotamia, Phrygia, and Lycaonia. But at present they are entirely confined to the countries above mentioned. Chagrin, a word derived from the Tatar *soğhré*, is made of the skin of these animals, which grows about the rump, and also those of horses, which is equally good. There are great manufactures of it at Astracan and in all Persia. It is a mistake to suppose it to be naturally granulated, for its roughness is entirely the effect of art. The Persians use the bile of the wild ass as a remedy against the dimness of sight: and the same people, and the Nogayan Tartars, have been known to endeavour the most infamous bestialities with it, in order to free themselves from the disorders of the kidneys.

The tame or *domestic ass*, is a humble, patient, and tranquil animal. He submits with firmness to strokes and chastisement: he is temperate both as to the quantity and quality of his food; he contents himself with the rigid and disagreeable herbage which the horse and other animals leave to him and disdain to eat: he is more delicate with regard to his drink, never using water unless it be perfectly pure. As his master does not take the trouble of combing him, he often rolls himself on the turf among thistles, ferns, &c. Without regarding what he is carrying, he lies down to roll as often as he can, seeming to reproach his master for neglect and want of attention. When very young, the ass is a gay, sprightly, nimble, and gentle animal. But he soon loses these qualities, probably by the bad usage he meets with; and becomes lazy, untractable, and stubborn. When under the influence of love, he becomes perfectly furious. The affection of the female for her young is strong: Pliny assures us, that when an experiment was made to discover the strength of maternal affection in a she-ass, she run through the flames in order to come at her colt. Although the ass be generally ill used, he discovers a great attachment to his master; he smells him at a distance, searches the places and roads he used to frequent, and easily distinguishes him from the rest of mankind. The ass has a very fine eye, an excellent scent, and a good ear. When overloaded, he hangs his head, and sinks his

ears: when too much teased or tormented, he opens his mouth and retracts his lips in a disagreeable manner, which gives him an air of ridicule and derision. If you cover his eyes, he will not move another step; if you lay him on his side, and place his head so that one eye rests on the ground, and cover the other with a cloth, he will remain in this situation without making any attempt to get up. He walks, trots, and gallops in the same manner as the horse; but all his motions are slower. Whatever be the pace he is going at, if you push him, he instantly stops.

The cry of the horse is known by the name of *neighing*; that of the ass, by *braying*, which is a long, disagreeable noise, consisting of alternate discords from sharp to grave and from grave to sharp; he seldom cries but when pressed with hunger or love: the voice of the female is clearer and more piercing than that of the male.

The ass is less subject to vermin than other animals covered with hair; he is never troubled with lice, probably owing to the hardness and dryness of his skin; and it is probably for the same reason that he is less sensible to the whip and spur than the horse. The teeth of the ass fall out and grow at the same age and in the same manner as those of the horse; and he has nearly the same marks in his mouth.

Asses are capable of propagating when two years old. The females are in season during the months of May and June. The milk appears in the duggs ten months after impregnation; the brings forth in the twelfth month, and always one at a time. Seven days after the birth, the season of the female returns, and she is again in a condition to receive the male. The colt should be taken from her at the end of five or six months, that the growth and nourishment of the fetus may not be obstructed. The stallion or jack-ass should be the largest and strongest that can be found; he should be at least three years old, and never ought to exceed ten. The ass, like the horse, takes three or four years in growing, and lives till he be 25 or 30: he sleeps less than the horse, and never lies down to sleep but when excessively fatigued. He is more robust, and less subject to diseases, than the horse.

Travellers inform us that there are two sorts of asses in Persia; one of which is used for burdens, they being slow and heavy: the other is kept like horses for the saddle; for they have smooth hair, carry their head well, and are much quicker in their motion; but when they ride them, they fit nearer their buttocks than when on a horse: they are dressed like horses, and are taught to amble like them; but they generally cleave their nostrils to give them more room for breathing. Dr Ruffel likewise tells us they have two sorts in Syria; one of which is like ours; and the other very large, with remarkable long ears; but they are both put to the same use, which is, to carry burdens.

In America there were originally no asses at all, nor yet horses: but they were carried thither long ago, at first by the Spaniards, and afterwards by other nations, where they multiplied greatly; inasmuch, that, in some places, there are whole droves of them that run wild, and are very hard to be caught. Asses in general carry the heaviest burdens in proportion to their bulk; and, as their keeping costs little or nothing, it

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is a great wonder that they are not put to more uses than they generally are among us. The flesh of the common ass is never eaten in these parts of the world; though some pretend their colts are tender, and not disagreeable.

3. The *Hemionus* of Pallas, or *WILD MULE*, is of the size and appearance of the common mule; with a large head, flat forehead growing narrow toward the nose, eyes of a middle size, the irides of an obscure ash-colour; 38 teeth in all, being two in number fewer than in a common horse; ears much longer than those of a horse, quite erect, lined with a thick whitish curling coat; neck slender, compressed; mane upright, short, soft, of a greyish-colour; in place of the foretop, a short tuft of downy hair about an inch and three quarters long. The body is rather long, and the back very little elevated; the breast protuberant and sharp. The limbs are long and elegant; the thighs thin, as in a mule's. Within the fore-legs there is an oval callosity; in the hind legs none. The hoofs are oblong, smooth, and black; the tail is like that of a cow, slender, and for half of its length naked, the rest covered with long ash-coloured hairs. Its winter coat grey at the tips, of a brownish ash-colour beneath; about two inches long, in softness like the hair of a camel, and undulated on the back. Its summer coat is much shorter, of a most elegant smoothness, and in all parts marked most beautifully with small vortexes. The end of the nose is white; from thence to the foretop inclining to tawny. The buttocks are white; as are the inside of the limbs and belly. From the mane a blackish testaceous line extends along the top of the back to the tail, broadest on the loins, and growing narrower towards the tail. The colour of the upper part of the body is a light yellowish grey, growing paler towards the sides. The length, from the tip of the nose to the base of the tail, is six feet seven inches; length of the trunk of the tail one foot four; of the hairs beyond the end, eight inches. The height of the animal is three feet nine. This species inhabits the deserts between the rivers Onon and Argun in the most southern part of Siberia, and extends over the vast plains and deserts of western Tartary, and the celebrated sandy desert of Gobi, which reaches even to India. In Siberia they are seen only in small numbers, as if detached from the numerous herds to the south of the Russian dominions. In Tartary they are particularly conversant about Tarincoor, a salt lake at times dried up. They shun wooded tracts and lofty snowy mountains. They live in separate herds, each consisting of a chief, a number of mares and colts, in all to the number of about 20; but seldom so many, for commonly each male has but five and sometimes fewer females. They copulate towards the middle or end of August; and bring for the most part but one at a time, which by the third year attains its full growth, form, and colour. The young males are then driven away from their paternal herds, and kept at a distance till they can find mates of their own age which have quitted their dams. These animals always carry their heads horizontally; but when they take to flight, hold them upright, and erect their tail. Their neighing is deeper and louder than that of a horse. They fight by biting and kicking, as usual with the horse: they are fierce and untamable; and even those which

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have been taken young, are so intractable as not to be broken by any art which the wandering Tartars could use. Yet was it possible to bring them into fit places, and to provide all the conveniences known in Europe, the task might be effected; but it is doubted whether the subdued animal would retain the swiftness it is so celebrated for in its state of nature. It exceeds that of the antelope; it is even proverbial; and the inhabitants of Thet, from the fame of its rapid speed, mount on it Chammo their god of fire. The Mongolians despair of ever taking them by the chase; but lurk behind some tomb, or in some ditch, and shoot them when they come to drink or eat the salt of the desert. They are excessively fearful animals, and provident against danger. A male takes on him the care of the herd, and always is on the watch. If they see a hunter, who by creeping along the ground has got near them, the sentinel takes a great circuit, and goes round and round him, as discovering somewhat to be apprehended. As soon as the animal is satisfied, it rejoins the herd, which sets off with great precipitation. Sometimes its curiosity costs it its life; for it approaches so near as to give the hunter an opportunity of shooting it. But it is observed, that in rainy or in stormy weather, these animals seem very dull, and less sensible of the approach of mankind. The Mongolians and Tungusi, according to Du Halden, kill them for the sake of the flesh, which they prefer to that of horses, and even to that of the wild boar, esteeming it equally nourishing and wholesome. The skin is also used for the making of boots. Their senses of hearing and smelling are most exquisite: so that they are approached with the utmost difficulty. The Mongolians call them *shibkikai*, which signifies "the eared;" the Chinese, *yo to yfo*, or "mule." In ancient times the species extended far to the south. It was the *hemionos* or half ass of Aristotle, found in his days in Syria, and which he celebrates for its amazing swiftness and its fecundity, a breeding mule being thought a prodigy; and Pliny, from the report of Theophrastus, speaks of this species being found in Cappadocia, but adds they were a particular kind.

The domestic MULES of present times (*equus mulus* of Gesner and Linnaeus) are the offspring of the horse and the ass, or ass and mare; are very hardy, and have more the form and disposition of the ass than the horse. The finest are bred in Spain; very large ones in Savoy.

4. The ZEBRA. This animal has the figure and gracefulness of the horse, joined to the swiftness of the stag. He is about seven feet long, from the point of the muzzle to the origin of the tail, and about four feet high. The colour of his skin is beautiful and uniform, consisting of alternate parallel rings of black and white, disposed in the most regular manner, as represented in the plate. He is generally less than the horse and larger than the ass. The zebra is found no where but in the eastern and southern provinces of Africa, from Ethiopia to the Cape of Good Hope, and from the Cape of Good Hope to Congo. The Dutch have been at great pains to tame and use them for domestic purposes, but with little success. He is hard-mouthed, and kicks when any person attempts to touch or come near him. He is restless and obdurate as a mule: but perhaps the wild horse is naturally as

untractable as the zebra; for it is probable, if he were early accustomed to obedience and a domestic life, he would become as docile as the horse.

5. The quagga, or quagga, is striped like the former on the head and body, but with fewer lines. The flanks are spotted; the rump is plain; the ground colour of the head, neck, body, and rump, a bright bay; the belly, thighs, and legs are white, and free from all marks. This species, till of late, has been supposed to be the female of the zebra; but recent observations prove that the male and female zebra are marked alike. This differs likewise in being thicker and stronger made, and in being more tractable; for instance, one had been so far broken as to draw in a cart. The Hotentots also distinguish them from the former, by the names of *quagga* and *opeagha*.

ERA, in chronology. See *ÆRA*.

ERANARCHA, a public officer among the ancient Greeks, whose business was to provide over and direct the alms and provisions made for the poor. Cornelius Nepos, in his life of Epaminondas, describes his office thus: When any person was reduced to poverty, taken captive, or had a daughter to marry, which he could not effect for want of money, &c. the eranarcha called an assembly of friends and neighbours, and taxed each according to his means and estate, to contribute towards his relief.

ERANTHEMUM, in botany: A genus of the monogynia order, belonging to the diandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is quinquefid, with the tube filiform; the antheræ without the tube; the stigma simple.

ERASISTRATUS, a celebrated physician, grandson to the philosopher Aristotle. He discovered by the motion of the pulse the love which Antiochus had conceived for his mother-in-law Stratonice, and was rewarded with 100 talents for the cure by the father of Antiochus. He was a great enemy to bleeding and violent physic.

ERASMUS (Desiderius), born at Rotterdam in 1467. He lost his father and mother at 14 years of age; and was committed to the care of certain guardians, who would force him to be an ecclesiastic, which he refused for a long time. However, he was obliged to assume the religious habit among the canons regular in the monastery of Stein near Tergou; but afterwards obtained a dispensation from his vows. He was the most learned man of the age in which he lived; and contributed, by his example and his writings, to the restoration of learning in the several countries in which he occasionally resided, viz. Italy, Switzerland, Holland, France, and England: with the last, he was most satisfied; and found the greatest encouragement from Henry VIII. Sir Thomas More, and all the learned Englishmen of those days. He published a great many books; and died at Basil in 1536. He was buried honourably, and his memory is still held in veneration. He had, however, many enemies; and as he did not embrace the reformation, and yet censured many things in popery, he hath been treated injuriously both by Catholics and Protestants. The works of Erasmus in 10 vols. folio were published at Leyden in 1706, in a very handsome manner, under the care

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of M. Le Clerc. Dr Jortin published his life in one vol. 4to, 1758.

ERASTIANS, a religious sect or faction which arose in England during the time of the civil wars in 1647, thus called from their leader Thomas Erastus, whose distinguishing doctrine it was, that the church had no right to discipline, that is, no regular power to excommunicate, exclude, censure, absolve, decree, or the like.

ERATO (from *ερα I love*), in mythology, the name of one of the nine muses who presided over love-poetry. To this muse some have ascribed the invention of the lyre and lute; and she is represented with a garland of myrtles and roses, holding a lyre in one hand and a bow in the other, and at her side a Cupid with his torch. There is also a Nereid of the same name.

ERATOSTHENES, a Cyrenæan philosopher, historian, and poet; called for his learning *Plato Minor*. He was keeper of the famous library at Alexandria; and was greatly in favour with Ptolemy Euergetes, by whose order he wrote a history of the Theban kings of Egypt, which succession was entirely omitted by Manetho. He thus fixed the Egyptian chronology, and his authority is by many preferred to that of Manetho. He wrote many other things, a catalogue of which is to be seen in Fabricius, Vossius, &c. but his only piece now remaining entire is a description and fabulous account of the stars. He starved himself in old age through grief for the dimness of his sight, about the 10th or 12th year of Ptolemy Epiphanes, 194 B. C.

ERATOSTRATUS, an Ephesian who burnt the famous temple of Diana the same night that Alexander the Great was born. This burning, as some writers have observed, was not prevented or seen by the goddess of the place, who was then present at the labours of Olympus, and at the birth of the conqueror of Persia. Eratosthratus did this villany merely to eternize his name by so uncommon an action.

EREBUS (*Ερεβος*, from *ερεν night*), in mythology, a term denoting darkness. According to Hesiod, Erebus was the son of Chaos and the night, and the father of the day. This was also the name of part of the *inferi* among the ancients: they had a peculiar expiation for those who were detained in Erebus.

Erebus was properly the gloomy region, and distinguished both from Tartarus the place of torment, and Elysium the region of bliss: according to the account given of it by Virgil, it forms the third grand division of the invisible world beyond the Styx, and comprehends several particular districts, as the *limbus infantum*, or receptacle for infants; the *limbus* for those who have been put to death without cause; that for those who have destroyed themselves; the fields of mourning, full of dark groves and woods, inhabited by those who died for love; and beyond these, an open champaign country for departed warriors.

ERECTION, in a general sense, the art of raising or elevating any thing; as the erection of a perpendicular, &c. It is also used in a figurative sense; as the erection of a bishopric, marquissate, &c.

ERECTION is particularly used by medical writers for the state of the penis when swelled and distended

by the action of the muscles called *erectores*. See ANATOMY, p. 739.

There is also an erection of the clitoris which is performed by muscles for that purpose.

EREMIT. See HERMIT.

ERETRIA (anc. geog.), a town of Eubœa, situated on the Euripus, in the south-west of the island. A very ancient city, and the largest of the island, after Chelcis. After being demolished by the Persians, it was restored on an adjoining spot, according to Strabo, who mentions a school of Eretreian philosophers there. The Abantes of Homer were of Eubœa.

ERFORT, a town of Germany, in the circle of Upper Saxony, the capital of Thuringia, and subject to the elector of Mentz. It is defended by good ramparts; and has a castle on an eminence, which commands the town. Its inhabitants are almost all Lutherans, but its principal churches belong to the Catholics. There are several handsome structures, both public and private; but the houses in general are but indifferently built. E. Long. 11. 14. N. Lat. 50. 49.

ERGASTULUM, among the Romans, was a prison, work-house, or house of correction, where slaves by the private authority of their masters were confined and kept for their offences to hard labour. The Greeks had a place of confinement of this sort called *Scaphogymnion*.

ERGOT, in farriery, is a stub, like a piece of soft horn, about the bigness of a chestnut, placed behind and below the pastern-joint, and commonly hid under the tuft of the fetlock.

ERICA, HEATH, in botany: A genus of the monogynia order, belonging to the octandria class of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is tetraphyllous; the corolla quadriid; the filaments inserted into the receptacle; the antheræ bifid; the capsule quadrilocular. Of this there are four species, natives of Britain; which are so well known, that no description needs be given of them. In the Highlands of Scotland this plant is made subservient to a great variety of purposes. The poorer inhabitants make walls for their cottages with alternate layers of heath and a kind of mortar made of black earth and straw. The woody roots of the heath are placed in the centre; the tops externally and internally. They make their beds of it, by placing the roots downwards; and the tops only being uppermost, they are sufficiently soft to sleep upon. Cabbins are also thatched with it. In the island of Ilay, ale is frequently made by brewing one part of malt and two of the tops of young heath; sometimes adding hops. Boethius relates, that this liquor was much used by the Picts. Woollen cloth boiled in alum water, and afterwards in a strong decoction of heath-tops, comes out of a fine orange colour. The stalks and tops will tan leather. Besoms and faggots to burn in ovens are also made of this plant. It is also used for filling up drains that are to be covered over. Sheep and goats will sometimes eat the tender shoots, but they are not fond of them. Cattle not accustomed to feed on heath, give bloody milk; but they are soon relieved by drinking plentifully of water. Horses will eat the tops. Bees extract a great deal of honey from

the flowers; and, where heath abounds, the honey has a reddish cast. There are many exotic species with which our green-house collections are enriched and adorned, as the triflora, tubiflora, australis, &c.

ERIDANUS (anc. geog.) a river of Attica, falling into the Ilissus.—Another Eridanus, the more ancient name of the Padus, an appellation ascribed by Pliny to the Greeks; followed in this by Virgil. It rises in mount Vesulus, in the Alpes Cottiae, and dividing the Cisalpine Gaul into the Cispadana and Transpadana, and swelled on each hand with no inconsiderable rivers from the other Alps and the Apennine, falls at seven mouths into the Adriatic. Famous in mythology, from the story of Phæton; whose sisters, the Heliades, were here changed into poplars, according to Ovid.

ERIDANUS, in astronomy, a constellation of the southern hemisphere, in form of a river.—The stars in the constellation Eridanus, in Ptolemy's catalogue, are 34; in Tycho's, 19; and in the British Catalogue, 84.

ERIE, a vast lake to the westward of Pennsylvania, in North America, situated between 80° and 87° W. Long. and between 41° and 42° N. Lat.

ERIGENA, or SCOTUS, (John), a famous scholastic divine, born about the beginning of the ninth century; but where, is a matter of dispute among authors. Bale and Pitts say he was born at St David's in Wales; Dempster, Mackenzie, and Henry, that he was born at Ayr in Scotland; which they infer from his names *Erigena* and *Scotus*, by the latter of which he was generally distinguished by his cotemporary writers. But Du Pin and Sir James Ware assert that he was by birth an Irishman; Ireland being in those days called *Scotia*, and by the natives *Erin*. They agree, however, in relating that he travelled to Athens, where he acquired a competent knowledge of the Greek and other oriental languages; and that he afterwards resided many years in the court of Charles the Bald, king of France, who, on account of his singular abilities, treated him as his intimate friend and companion. He slept frequently in the royal apartment; and was constantly admitted to the king's table. "We may judge (says a modern historian) of the freedom which he used with Charles, by the following repartee. As the king and Scotus were sitting one day at table, opposite to each other, after dinner, drinking a cheerful glass, the philosopher having said something that was not quite agreeable to the rules of French politeness, the king in a merry humour asked him, Pray what is between a *Scot* and a *foi*? To which he answered, "Nothing but the table." See *Henry's History of Great Britain*, vol. I. p. 344. who quotes this story from *Hoveden's Annals*, ad an. 86. Quer. What language were they talking when this *bon mot* was uttered?

During his residence with Charles, he wrote several books of scholastic divinity; which, though absurd enough, were at that time not sufficiently so to secure him from the imputation of heterodoxy; and on that account the pope commanded Charles the Bald to send him to Rome; but the king had too great a regard for his companion to trust him with his holiness. One of the chief controversies in which Scotus was engaged, and with which the pope was much offended, was concerning the real presence and blood of Christ in the wafer.

Erigena
||
Erigone.

wafer. His opinion of this weighty matter is expressed in these few words: "What we receive corporally is not the body of our Lord; but that which feeds the soul and is only perceived by faith." He was also engaged in two other controversies of equal importance, but of a somewhat less delicate nature. The first was, Whether any part of the eucharist be evacuated by stool? and the second, Whether Christ was born of the Virgin Mary *aperta vulva*; Paschasius was of opinion, that this could not be without some injury to her perpetual virginity; and therefore believed that Christ came into the world *per vulvam clausam*, as he came into the place where his disciples were assembled, through the door and not through the wall, without opening the door. Concerning the first of these delicate questions, Scotus with several others declared, that part of the eucharist was certainly evacuated by stool; for which they were honoured with the appellation of *Stercoris*. And as to the second question, he said, that the *vulva clausa* was a dangerous opinion: for it would thence follow, that he was not born, but issued; *non est natus, sed erumpi*. See Macenzie, vol. I. p. 55.

Whether this John Scotus returned to England, or ended his days in France, is a matter of doubt. Some of our historians tell us, that he left France in the year 864; and that, after residing about three years in Oxford, he retired to the abbey of Malmesbury, where his scholars stabbed him with their pen-knives. There is no foundation for this story. Probably he died about the year 874; but whether in France or England, is uncertain, and of little importance. Some have related, that he was invited to England by king Alfred: but in this they confound him with John, abbot of Etheling, who was assassinated in 895; and to this mistake the various accounts concerning this author are to be attributed. Regardless of his history, he appears from his writings to have been a man of parts, and, in point of learning, superior to any of his contemporaries. He wrote, 1. *De divisione nature*, lib. v. 2. *De predestinatione Dei*. 3. *Excerpta de differentiis & societatis Greci Latineque verbi*. 4. *De corpore et sanguine Domini*. 5. *Ambigua S. Maximi seu scholasticus in difficultes locos S. Gregorii Nazianzeni, Latine versa*. 6. *Opera S. Dionysii quatuor in Latinam ling. conversa*. All published. 7. *De visione Dei*, and several other works, in manuscript, preserved in different libraries.

ERIGERON, FLEA-BANE, in botany: A genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The receptacle is naked; the pappus hairy; the florets of the radius are linear, and very narrow. There are five species; of which the most remarkable is the viscosum, or male flea-bane of Theophrastus, and greater flea-bane of Dioscorides. It is a native of the south of France and Italy; and hath a perennial root, from whence arise many upright stalks near three feet high. The leaves in warm weather sweat out a clammy juice; the flowers are produced single upon pretty long footstalks, are of a yellow colour, and have an agreeable odour. The plants are easily propagated by seeds; and thrive best in a dry soil and sunny exposure.

ERIGONE, in fabulous history, daughter to Ica-

rius, died of grief for her father's death, was translated into heaven, and makes the sign Virgo.

ERINACEUS, or HEDGEHOG, in zoology; a genus of quadrupeds belonging to the order of feræ, the characters of which are these: They have two fore-teeth in the upper jaw, at a considerable distance from one another, and two in the under jaw, less distant; and they have two recumbent dog-teeth, one on each side. The hedge-hog has a very uncommon method of defending himself from the attacks of other animals: being possessed of little strength or agility, he does not attempt to fly from or assail his enemies; but erects his bristles, and rolls himself up like a ball, exposing no part of his body that is not furnished with sharp weapons of defence; he will not unfold himself, unless thrown into water: the more he is frightened or harassed, the closer he shuts himself up; and frequently discharges his urine, which has a very fetid and loathsome smell. While in this state, most dogs, instead of biting him, stand off and bark, not daring to seize him; or, if they attempt it once, their mouths are so prickled with his bristles, that they cannot be prevailed upon to attempt it a second time. Both the male and female are covered with bristles from the head to the tail. These bristles are of great use in defending them from other animals; but must be very inconvenient when they incline to copulate. This operation they cannot perform in the manner of other quadrupeds; but do it face to face, either standing on end, or the female lying on her back. The females come in season in the spring, and bring forth their young in the beginning of summer. They commonly bring forth three or four, and sometimes five at a time. The young ones are of a whitish colour, and only the points of the bristles appear above the skin. It is impossible to tame them: the mother and her young have frequently been confined together, and furnished with plenty of provisions; but, instead of nourishing them, she uniformly devoured them one after another. Males and females have likewise been kept in one apartment, where they lived, but never copulated. Hedge-hogs feed upon fallen fruits, some roots, and insects: they are very fond of flesh-meat, whether raw or roasted. They frequent woods, and live under the trunks of old trees, in the chinks of rocks, or under large stones. Naturalists allege, that they go into gardens, mount the trees, and come down with pears, apples, or plums, stuck upon their bristles. But this is a mistake: although kept in a garden, they never attempt to climb trees, or stick even fallen fruit upon their bristles, but lay hold of their food with their mouth. They never come out of their holes in the day, but go about in quest of food during the night. They eat but little, and can live very long without taking any nourishment. They do not lay up any store of provisions in harvest; such an instinct would be useless, as they sleep all the winter. They lie under the undeserved reproach of sucking cattle and hurting their udders; but the smallness of their mouth renders that impossible. There are three species, viz.

1. The europæus, or common hedgehog, with round ears, and crested nostrils. It is about nine inches long; the upper part of the body is totally covered with sharp prickles, and the under part is covered with hair. The hedgehog, even when standing on

Erinaceus.

Plate
CLXXXV,

Eringo

Erivan.

his legs, has a very ugly aspect. His body is an oblong mass, convex above, terminated on the fore-part by a very sharp muzzle, and mounted on four short legs, of which nothing appears but the feet, and the tail is not discernible. His ears are broad, round, and short; and his eyes are small and protuberant. The length of his body, from the point of the muzzle to the anus is about nine inches.—2. The inauris, or white hedge-hog, has no external ears. It is a native of America. 3. The malaccensis has hanging ears, and is a native of Asia.

ERINGO, in botany. See ERYNGIUM.

ERINUS, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 40th order, *Personate*. The calyx is pentaphyllous; the limb of the corolla quinquefold and equal; with its lobes emarginated, and the upper lip very short and reflexed; the capsule bilocular. There are six species, none of them natives of Britain. They grow from two inches to four feet in height, and are adorned with flowers of a white or purple colour. They are propagated by seeds, but in this country generally require to be kept in a stove.

ERIOCAULON, in botany: A genus of the trigynia order, belonging to the triandria class of plants; and in the natural method ranking with the sixth order, *Enfatæ*. The common calyx is an imbricated capitulum or knob; there are three equal petals; and the stamina are on the germen.

ERIOCEPHALUS, in botany: A genus of the polygamia necessaria order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The receptacle is somewhat villous; there is no pappus; the calyx is decaphyllous and equal; the radius has five florets.

ERIPHORUM, in botany: A genus of the monogynia order, belonging to the triandria class of plants; and in the natural method ranking under the third order, *Calamariæ*. The glumes are palaceous and imbricated all round; there is no corolla; and only one seed furnished with a very long down.

ERITHALIS, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is quinquepartite; the calyx ureolated or bladder-like, the berry decemlocular inferior.

ERIVAN, a city of Persia, in Asia, and capital of Persian Armenia. It is a large, dirty, ill-looking place, in which are no handsome buildings, the houses being very mean, and raised with earth or mud; but it is full of gardens or vineyards. It is situated in a plain which is surrounded on all sides with mountains. Two rivers pass near it, the Zengui to the north-west, and the Queur Boulac to the south-west. The fortrefs may pass for a town of itself; it is of an oval form, and is four miles in circumference, containing about 800 houses. It is inhabited by none but the native Persians. The Armenians have shops in it, where they work and trade in the day-time, but at night return to their habitations in the city. The fortrefs is surrounded with three walls, made with bricks dried in the sun, which have battlements, and are flanked with towers, and defended with ramparts. On the north-

Eriphyle

Ermin.

east there is a dreadful precipice, above 200 yards in depth, at the bottom of which the river runs. The garrison usually consisted of 2000 men; but how many there are since the revolution, is hard to say. The palace of the governor of the province is within the fortrefs. The city is about a cannon's shot distant from the fortrefs, and the space between is full of houses and markets. E. Long 44. 50. N. Lat. 40. 20.

ERIPHYLE (fab. hitt.), a sister of Adrastus king of Argos, who married Amphiarus. She was daughter of Talauus and Liimache. When her husband concealed himself that he might not accompany the Argives in their expedition against Thebes, where he knew he was to perish, Eriphyle suffered herself to be bribed by Polyneices with a golden necklace which had been formerly given to Hermione by the goddess Venus, and she discovered where Amphiarus was. This treachery of Eriphyle compelled him to go to the war; but before he departed, he charged his son Alecmzon to murder his mother as soon as he was informed of his death. Amphiarus perished in the expedition; and his death was no sooner known than his last injunctions were obeyed, and Eriphyle was murdered by the hands of her son.

ERIS, the goddess of discord among the Greeks. She is the same as the *Discordia* of the Latins.

ERISICHTHON (fab. hitt.), a Thessalian, son of Triops, who derided Ceres and cut down her groves. This impiety irritated the goddess, who afflicted him with continual hunger. He squandered all his possessions to gratify the cravings of his appetite, and at last he devoured his own limbs for want of food. Some say that his daughter had the power of transforming herself into whatever animal he pleased, and that she made use of that artifice to maintain her father, who fold her, after which she assumed another shape, and became again his property.

ERMIN, in zoology. See MUSTELA.

ERMIN, or *Ermine*, in heraldry, denotes a white field or fur, powdered or interspersed with black spots, called *powdering*. It is supposed to represent the skin of an animal of the same denomination (see MUSTELA). There is however no animal whose skin naturally corresponds to the herald's ermin.

The animal is milk white; and so far is it from having spots, that tradition reports, that it will rather die or be taken than fully its whiteness. Whence its symbolical use.

But white skins having for many ages been used for the linings of the robes of magistrates and great men; the furriers at length, to add to their beauty, used to sew bits of the black tails of those creatures upon the white skins, to render them the more conspicuous. Which alteration was introduced into armoury.

The fable spots in ermin are not of any determinate number, but they may be more or less at the pleasure of the painter or furrier.

ERMIN, an order of knights, instituted in 1450 by Francis I. duke of Bretagne, and formerly subsisting in France. The collar of this order was of gold, composed of ears of corn in saltire; at the end of which hung the ermin, with this inscription, *a mai vie*. But the order expired when the dukedom of Bretagne was annexed to the crown of France.

Ermines

Ermines

ERMINES, in heraldry, the reverse of ermine, i. e. white spots on a black field.

ERMINITES, in heraldry, should signify little ermines, but it is otherwise; for it signifies a white field powdered with black, only that every such spot hath a little red hair on each.—Erminites also signify a yellow field powdered with black, which the French express much better by *or semé d'ermine de sable*.

ERMINOIS, in heraldry, signifies the field or, and the spots black.

EROORO, in ornithology. See ALCEO, of which it is a species.

EROS (of *eros* "love"), in mythology, one of two chiefs over all the other Cupids, being the cause of love. See ANTEROS.

EROTIA, a festival in honour of Eros the god of love. It was celebrated by the Thespians every fifth year with sports and games, when musicians and others contended. If any quarrels or seditions had arisen among the people, it was then usual to offer sacrifices and prayers to the god, that he would totally remove them.

EROTIC (derived from *eros* "love;" whence *erotico*), is applied to any thing which has a relation to the passion of love.

In medicine we find the phrase *delirium eroticum* used for a kind of melancholy contracted through excess of love.

EROSION, among physicians, denotes much the same with CORROSION, only in a stronger degree.

EROTESIS. See ORATORY, n° 04.

ERPENIUS (Thomas), in Dutch THOMAS OF ERPE; a celebrated professor of the Arabic language, was born at Gorcum in Holland, in 1584, and educated at Leyden. He applied himself to the oriental languages at the persuasion of Joseph Scaliger; and afterwards travelled into England, France, Italy, and Germany, and every where obtained the esteem of the learned. On his return to Holland, he was made professor of Arabic in the university of Leyden, and died there in 1624. He published a great many excellent works, which spread his reputation through the whole learned world. It is said, that the king of Morocco admired so greatly the letters Erpenius wrote to him in Arabic in the name of the United Provinces, that he could not cease reading them, and showing them to those who spoke that language naturally.

ERRATIC, in general, something that wanders, or is not regular: hence it is the planets are called *erratic stars*.

ERRHINES, in pharmacy, medicines which when snuffed up the nose promote a discharge of mucus from that part.

Among the milder kinds of the errhines we may reckon marjoram, basilicon, thyme, hyssop, savory, marum syriacum, the tops of origanum, flowers of lilies of the valley, and gum benzoin, the resin of guaiacum, fine raspings of aloes wood, dry volatile salt of sal ammoniac perfumed with oil of marjoram, as also white vitriol. On the contrary, violent errhines are, euphorbium, the powder of white hellebore, and, in a milder degree, several sorts of snuffs, precipitate mercury, and pepper.

Errhines are more friendly to the constitution and

Error

nerves than sternutatories, by their subtle, acrid, and volatile salt gently stimulating the pituitary membrane, and drawing the mucid humour from it. They are also much safer than sternutatories in their effects.

Erhines prepared of cephalic herbs are of singular service in oppressive pains of the head, a hermicania, lethargic disorders, weakness of memory, fluxings of the head, and coryza; mucous fluxions of the eyes, drowfulness, vertiges, and in cases where the malignant humours generated by the lues venerea are lodged in the membranes of the nostrils.

ERROR, in philosophy, a mistake of our judgment, giving assent to that which is not true.

Mr Locke reduces the causes of error to these four; first, want of proofs; secondly, want of ability to use them; thirdly, want of will to use them; and, fourthly, wrong measures of probability.

He observes upon the first of these causes of error, that the greatest part of mankind want conveniences and opportunities of making experiments and observations themselves, or of collecting the testimony of others, being prevented by the necessity of their condition. Upon the second of these causes, he observes, that there are many, who, from the state of their condition, might bestow time in collecting proofs, but yet are not able to carry a train of consequences in their heads, nor weigh exactly the preponderancy of contrary proofs and testimonies, merely from the difference in mens understandings, apprehensions, and reasonings. Thirdly, he remarks, that though some have opportunities and leisure enough, and want neither parts, learning, nor other helps, that they never come to the knowledge of several truths within their reach, either upon account of their attachment to pleasure or business; or otherwise because of their laziness or aversion to study. The fourth cause of error, viz. wrong measures of probability, he imputes, 1. To the practice of taking for principles propositions that are not in themselves certain and evident, but, on the contrary, doubtful and false. 2. To received hypotheses. 3. To predominant passions or inclinations. And, 4. To authority, or the giving up our assent to the common received opinions either of our friends or party, neighbours or country.

The causes of error in philosophy, or the reasons why all former philosophers have through so many ages erred, according to Lord Bacon, are these following.

1. Want of time suited to learning.
2. The little labour bestowed upon natural philosophy.
3. Few entirely addicted to natural philosophy.
4. The end of the sciences wrong fixed.
5. A wrong way chosen.
6. The neglect of experiments.
7. Regard to antiquity and authority.
8. Admiration of the works in use.
9. The artifice of teachers and writers in the sciences.
10. Ostentatious promises of the moderns.
11. Want of proposing worthy tasks.
12. Superstition and zeal being opposite to natural philosophy, as thinking philosophy dangerous, on account of the school-theology; from the opinion that deep natural inquiries should subvert religion.
13. Schools and academies proving unfavourable to philosophy.
14. Want of rewards.
15. Despair, and the supposition of impossibility.

ERROR Loci. Boerhaave is said to have introduced the term, from the opinion that the vessels were of

dis-

different sizes for the circulation of blood, serum, and lymph; and that when the larger-sized globules were forced into the lesser vessels by an error of place, they were obstructed. But this opinion does not seem well grounded.

ERUCA, in general, denotes caterpillars of all kinds.

The caterpillar state is that through which every butterfly must pass before it arrives at its perfection and beauty: and, in the same manner, all the known winged animals, except only the pueron, pass through a reptile state; none of them, except this, being produced in their winged form. The change from caterpillar to butterfly was long esteemed a sort of metamorphosis; a real change of one animal into another: but this is by no means the case. The egg of a butterfly produces a butterfly, with all lineaments of its parent; only these are not disclosed at first, but for the greater part of the animal's life they are covered with a sort of case or muscular coat, in which are legs for walking, which only suit it in this state; but its mouth takes in nourishment, which is conveyed to the included animal; and after a proper time this covering is thrown off, and the butterfly, which all the while might be discovered in it by an accurate observer with the help of a microscope, appears in its proper form. Before it passes into this state, however, there requires a state of rest for the wings to harden, and the several other parts to acquire their proper firmness; this is transacted in a time of perfect rest, when the animal lies in what is called the *nymph* or *chrysalis* state, in appearance only a lump of inanimate matter. There is a settled and determined time for each of these changes in every species; but, in the several different kinds, the periods are very different.

There is no sign of sex in the animal while in the caterpillar state: the propagation of the species is the business of the creature in its ultimate perfection; and till that, these parts are never excluded: one female butterfly, when she has been impregnated by the male, will produce 300 or 400 eggs, or even more.

There is no way of knowing the sexes of these little creatures by viewing the parts; but the whole figure and manner of the animal makes the difference. The females are always larger than the males; they are also more slow in their motions; and some of them have no wings, or, at the most, only very small ones. The males, however, have a sort of beards, more beautiful than the antennæ or horns of the females: the female is much stronger as well as bigger than the male; and not unfrequently, in case of danger or disturbance, she flies away with him in time of copulation.

On dissecting the female, her uterus affords an astonishing sight. The number of eggs in the tubes is amazing: but these have not all the same figure; and, in some species, as the silk-worm, &c. the eggs are of a beautiful blue; if any yellowish ones are seen among them, they are judged to be defective.

The care of all the butterfly tribe to lodge their eggs in safety is surprising. Those whose eggs are to be hatched in a few weeks, and who are to live in the caterpillar state during part of the remaining summer, always lay them on the leaves of such plants as will afford a proper nourishment; but, on the contrary, those whose eggs are to remain unhatched till the following spring, always lay them on the branches of

trees and shrubs, and usually are careful to select such places as are least exposed to the rigour of the ensuing season, and frequently cover them from it in an artful manner. Some make a general coat of a hairy matter over them, taking the hairs from their own bodies for that purpose; others hide themselves in hollow places in trees, and in other sheltered cells, and there live in a kind of torpid state during the whole winter, that they may deposit their eggs in the succeeding spring, at a time when there will be no feverities of weather for them to combat. The day-butterflies only do this, and of these but a very few species; but the night ones, or phalaenæ, all without exception, lay their eggs as soon as they have been in copulation with the male, and die immediately afterwards.

It is well known, that the common and natural food of these creatures is the leaves and verdure of vegetables; yet, as weak and harmless as they seem, they will many of them destroy their fellows whenever they get an opportunity. M. Reamur gives us an instance of this in 20 caterpillars of the oak, which he kept in a box with a sufficient quantity of their natural food: yet their numbers daily decreased, till at last there remained only one. This is, however, only the case in some few species, the generality of these animals being very peaceable, many species living together in the same place without molesting one another. These species, however, though freed from such dangers, are exposed to others of a much more terrible kind; the worms or maggots of several sorts of flies are frequently found about them, some preying upon their outside, others lodged within them under the skin, but both kinds eating the poor defenceless creature up alive. Those which feed on the outdies are easily discovered, the others are more hid; and frequently the caterpillar, which seems very hearty and vigorous, and very fleshy, shall be found, upon opening, to be a mere skin, the internal parts being found to be all eaten away, and all the food that he swallows serving only to feed a vast number of worms, or maggots, which crawl about at liberty within him. These devouring worms are of many different species; some being of the gregarious, some of the solitary kinds, and some spinning webs of their own silk to transform themselves in; others undergoing that change without any such covering. The beautiful cabbage-caterpillar is one of those unhappy kinds which frequently are infested with the gregarious kinds, large numbers of which spin themselves webs one after another, and afterwards come out in the shape of the parent-fly to whose eggs they owed their origin.

These intestine enemies are a sure prevention of the butterfly's appearing at its proper time; and as many of the former naturalists, who knew what butterfly to expect from a peculiar species of caterpillar which they preserved, often saw a parcel of flies come out in the place of it, they having no idea that the fly had laid its eggs in the flesh of the poor creature, supposed that this was one of its natural transformations, and that certain species of caterpillars sometimes produced butterflies, sometimes small flies.

These, and many other destroyers, among which the birds are to be reckoned in the principal place, serve a noble purpose in preventing the too great number of these mischievous animals. Their usual habitation

Eruca.

tion being the leaves and flowers of plants, they are, in their feeding, much exposed to all those destroyers: yet nature has taken care to preserve a great number, by making many of them so exactly of the colour of the leaves they feed on, that they are not easily distinguished from them; and by giving others a caution of keeping on the under part of the leaves, and being by that means out of sight. But some species are much less exposed, and of much more mischief to the plants they feed on, by devouring more essential parts of them. Of these some eat the roots, and others the interior part of the trunk, destroying the vessels that imbibe, and those that distribute the juices. These are different from the common caterpillars, in that their skin is much less rough and hard; and these are secure from our observation, and in general from their great destroyers the birds. They are not, however, absolutely safe from the common dangers of the other species; for there is a kind of worms that find their food and habitation even in the bodies of these.

The root caterpillars, and those which live within the branches of plants, are much more easily found out. The roots of scrophularia, and the stalks of lettuces, and some other plants, afford caterpillars which seem all of the same species. Those found in the lettuces are extremely plentiful some years, and destroy vast quantities of that plant. These usually have their first habitation in the stalk, near the root.

Nothing more surprises us, in regard to insects, than their industry; and in this the caterpillars yield to no kind, not to mention their silk, the spinning of which is one great proof of it. The sheaths and cases which some of these insects build for the passing their transformations under, are, by some, made of the silk, with their own hair, mixed with pieces of bark, leaves, and other parts of trees, with paper, and other materials; and the structure of these is well worthy our attention.

There are others whose workmanship, in this article, far exceeds these. There is one which builds in wood, and is able to give its case a hardness greater than that of the wood itself in its natural state. This is the strange horned caterpillar of the willow, which is one of those that eat their *exuvia*. This creature has extremely sharp teeth, and with these it cuts the wood into a number of small fragments: these fragments it afterwards unites together into a case, of what shape it pleases, by means of a peculiar silk; which is no other than a tough and viscous juice, which hardens as it dries, and is a strong and firm cement. The solidity of the case being thus provided for, we are to consider, that the caterpillar inclosed in it is to become a butterfly; and the wonder is, in what manner a creature of this helpless kind, which has neither legs to dig nor teeth to gnaw with, is to make its way out of so firm and strong a lodgment as this is in which it is hatched. It has been supposed by some, that the butterfly, as soon as hatched, discharged a liquor which softened the viscous matter that holds the case together, and so its several fragments falling to pieces, the way out lies open. This is evidently the truth of the case; though those who supposed it, did it by mere conjecture: for, on a strict examination, this liquor is always to be found in the animal, and is of the most proper kind for such a service. Reaumur judged, from the effects, that this li-

quor must be of a singular nature, and very different from the generality of animal fluids: and in dissecting this creature in the caterpillar state, there will always be found near the mouth, and under the oesophagus, a bladder of the bigness of a small pea, full of a limpid liquor, of a very quick and penetrating smell, and which, upon divers trials, proves to be a very powerful acid; and among other properties, which it has in common with other acids, it sensibly softens the glue of the case, on a common application.

It is evident that this liquor, besides its use to the caterpillar, remains with it in the chrysalis state, and is the very thing that gives it a power of dissolving the structure of the case, and making its way through in a proper manner at the necessary time. Dr Boerhaave has adopted the opinion, that there are no true acids in animals, except in the stomach or intestines; but this familiar instance proves the error of that determination. Phil. Trans. abr. ix. p. 39, &c.

Another very curious and mysterious artifice, is that by which some species of caterpillars, when the time of their changing into the chrysalis state is coming on, make themselves lodgments in the leaves of the trees, by rolling them up in such a manner as to make themselves a sort of hollow cylindric case, proportioned to the thickness of their body, well defended against the injuries of the air, and carefully secured for their state of tranquillity.

Besides these caterpillars, which in this manner roll up the leaves of plants, there are other species which only bend them once; and others which, by means of thin threads, connect many leaves together to make them a case. All this is a very surprising work, but all much inferior to this method of rolling.

The different species of caterpillars have different inclinations, not only in their spinning and their choice of food, but even in their manners and behaviour one to another. Some never part company from the time, of their being hatched to their last change; but live and feed together, and undergo together their last change into the chrysalis state. Others separate one from another as soon as able to crawl about, and each hunts its fortune single; and there are others which regularly live to a certain time of their lives in community, and then separate each to shift for itself, and never to meet again in that state. Reaumur, *Ép. Insect.* vol. ii. *passim*.

Caterpillars are very destructive and pernicious in gardens, particularly those of two species. The one of these is that which afterwards becomes the common white butterfly. This is of a yellowish colour, spotted with black; and infests the leaves of cabbages, cauliflowers, and the Indian creels, of which it eats off all the tender parts, leaving only the fibres entire; so that whole plantations are often seen destroyed by them in autumn, especially such as are near large buildings, or are crowded with trees. There is no remedy against this evil but the pulling the creatures off before they are spread from the nests, and watching the butterflies, which are daily, in the hot weather, depositing their eggs on these plants. These, however, feed principally on the outside of the leaves of the plants, and are therefore the easier taken off; but the other kind lies near the centre, and therefore is with much more difficulty discovered. This is much larger; and the

Eruca.

Eruca.

skin is very tough, and of a brown colour. It is called by the gardeners a *grub*, and is extremely pernicious. The eggs which produce it are usually deposited in the very heart or centre of the plant, particularly in cabbages; and the creature, when formed, and grown to some size, eats its way through all the blades, and leaves its dung in great quantity behind it, which spoils the cabbage. This insect also burrows under the surface of the ground, and makes sad havoc among young plants, by eating off their tender stalks, and drawing them into its holes. This mischief is chiefly done in the night; but wherever a plant is seen thus destroyed, if the earth be stirred with a finger an inch deep, the creature will be certainly found, and this is the only way of destroying them. *Miller.*

When these animals attack fruit-trees, the best method of driving them off is to boil together a quantity of rue, wormwood, and the common tobacco, of each equal parts, in common water; to make the liquor very strong, and sprinkle it on the leaves and young branches every night and morning, during the time when the fruit is ripening. See also the article *CATERPILLAR*.

In Dr Hawkefworth's Account of the Voyages to the South Sea, vol. iii. p. 520. we have the following account of a kind of small green caterpillar, which the voyagers found in great numbers on the true West Indian mangroves. Their bodies were thick set with hairs, and they were ranging on the leaves side by side like files of soldiers, to the number of 20 or 30 together. When they touched them, they found that the hairs on their bodies had the quality of a nettle, and gave them a much more acute though less durable pain.

ERUCA Aquatica, Water Caterpillars. It may seem incredible, that there is any such thing as a caterpillar whose habitation is under water; but experience and observation prove, that there are such, and that they feed on the water-plants as regularly as the common kinds do on those at land. These are not named at random like many of the aquatic animals of the larger kinds, as the sea-wolf, the sea-horse, &c. which might as well be called any thing else as *wolves* and *horses*; but they are properly what they are called, and do not respire in the manner of the fish-tribe, but by their stigmata as other caterpillars. M. Reaumur, in his observations, met with two species of these; the one upon the potamogeton or pond-weed, the other upon the lenticula or duck-meal. These are both very indolent animals; but the first being much the largest, its operations are more easily distinguished.

This, though truly an aquatic animal, swims but badly, and does not at all love to wet itself. The parent butterfly lays her egg on the leaf of a certain plant; and as soon as the young caterpillar is hatched, it gnaws out a piece of the leaf, of a roundish shape. This it carries to another part of the same leaf, and lays it in such a manner, that there may be a hollow between, in which it may lodge. It then fastens down this piece to the larger leaf with silk of its own spinning; only leaving certain holes at which it can put out its head, and get to gnaw any of the leaves that are near. It easily gets out, though the aperture be

Nº 118.

Eruca.

naturally small, since a little force from its body bends up the upper leaf and down the lower, both being flexible; and when the creature is out, it has a sort of down that defends it from being wetted, and the natural elasticity of the leaves and of the silk joins the aperture up again, so that no water can get in. The leaves of this kind of plant are also naturally very slippery, and not easily wetted by water. It soon happens that this habitation becomes too small for the animal, in which case it makes just such another; and after that, at times, several others; each being only made fit for it at the size it is then of. The changes of this creature into the chrysalis and butterfly states are in the common method. The butterfly gets out of a chrysalis which was placed on the surface of the water; the lightness of the animal easily sustains it on the water till its wings are dried, and then it leaves that element, never to return to it again.

ERUCA Sylvestris, Wood-caterpillars; the name of a sort of caterpillars which do not live, after the manner of others, on leaves of trees or plants, or open to our observation; but under the bark, in the trunk and branches, and in the roots of trees, and sometimes in the body of fruits.

These are easily distinguished from those worms and maggots which are found in roots and fruits, and owe their origin to flies of another kind; but are liable to be confounded with a sort of animals, called by M. Reaumur, *false* or *bastard caterpillars*, which carry a great resemblance in their figure to real caterpillars, but which have more legs than any of the true ones have, and are finally transformed into four-winged flies, which are not true butterflies.

The butterflies which are the parents of those caterpillars that lie immured in trees or fruits, lay their eggs on the surface; and the young caterpillars, when hatched, eat their way in. What appears something surprising, however, in this, is, that there usually is only one caterpillar in a fruit which is large enough to afford food to a great number; and if there are sometimes found two creatures within, one is usually a caterpillar, the other a worm of some other kind. The whole occasion of which is, that the operation of penetrating into the fruit is so difficult to the young animal, that it seldom succeeds in it; and tho' the butterfly deposits many eggs on each fruit, and these all hatch, yet it is only here and there one on a fruit that can find the way into it.

These creatures, when once lodged in their prison, have nothing to do but to eat up the substances which inclose them, leaving the outer hard shell unhurt, which still serves as a case for them. This is a very frequent case in the grains of corn, where the farinaceous substance serves as aliment, and the hard outer skin becomes a firm hollow case afterwards for the animal. The farinaceous substance in this case usually proves enough for the animal in its caterpillar state; but if it does not, the creature has recourse to a very singular expedient: it eats again its own excrements; and finds its now stronger stomach able to separate nourishment from that very matter which had before passed off from its weaker stomach undigested.

Of these species of caterpillars, some go out of their prison in order to change into their chrysalis, and thence into their butterfly state; but the greater num-

ber

Erudition ||
Ervinc. ber remain there, and pass through all their changes within. These caterpillars, like all the other kinds, have certain flesh-eating worms, whose parents are of the fly-kind, for their terrible enemies and destroyers; and it is not unfrequent, on opening one of these spoiled fruits, instead of the expected caterpillar, to find a fly just ready to come out: this has been produced from the chrysalis of a worm, which had before found its way into the fruit, and eat up the caterpillar, which was the original possessor of the place.

ERUDITION, denotes learning or knowledge; and chiefly that of history and antiquity, of languages and of books, which is the result of hard study and extensive reading. The Scaligers were men of deep erudition: the writings of M. Launoy, a priest of the Oratory, are full of erudition.

Mr Locke says, it is of more use to fill the head with reflections than with points of erudition. If the mind be not just and right, ignorance is better than erudition, which only produces confusion and obscurity. M. Balzac calls a heap of ill chosen erudition the luggage of antiquity.

ERUPTION, in medicine, a sudden and copious excretion of humours, as pus or blood: it signifies also the same with exanthema, any breaking out, as the pustules of the plague, small-pox, measles, &c.

ERUPTION of Volcanoes. See **ÆTNA**, **ETNA**, **VE-SUVIUS**, **VOLCANO**, &c.

ERVUM, the **LENTIL**: A genus of the decandria order, belonging to the diadelphica class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is quinquepartite, the length of the corolla. There are six species; of which the most remarkable is the lens, or common lentil. It is cultivated in many parts of England, either as fodder for cattle, or for the seeds which are frequently used in meagre soups. It is an annual plant, and rises with weak stalks about 18 inches high, garnished with winged leaves composed of several pairs of narrow lobes, terminated by a clasper or tendril, which fastens to any neighbouring plant, and is thereby supported: the flowers come out three or four together, upon short footstalks from the side of the branches. They are small, of a pale purple colour, and are succeeded by short flat pods, containing two or three seeds which are flat, round, and a little convex in the middle. The seeds of this plant are most commonly sown in the month of March, where the land is dry; but in moist ground, the best time is April. The usual quantity of seed allowed for an acre of land is from one bushel and a half to two bushels. If these are sown in drills in the same manner as peas, they will succeed better than when sown in broadcast: the drills should be a foot and a half asunder, to allow room for the Dutch hoe to clean the ground between them; for if the weeds are permitted to grow among them, they will get above the lentils and starve them.

There is another sort of lentil also cultivated in this country under the name of *French lentil*. It is twice the size of the former, both in plant and seed; and is much better worth cultivation than the other. It should be sown in March, after a single ploughing, in the ground that bore corn the year before. Manure is not absolutely necessary, though it will undoubtedly

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increase the crop. Its graft is said to be very copious; it may be mowed many times in the year, and affords a healthy as well as an agreeable food to horses, cows, and sheep: the milk of cows fed with it is said to be very copious and good. Long and numerous pods ripen about the beginning of winter, which afford a new kind of legumen, to be eaten as common lentils: when fresh, it makes admirable pease-soup; dry, it is greedily eaten by the poultry. The dried herb is also a good rehouse for cattle in winter. It grows on any kind of ground.

ERYMANTHUS, a mountain, river, and town of Arcadia, where Hercules killed a prodigious boar, which he carried on his shoulders to Erytheus; who was so terrified at the sight, that he hid himself in a brazen vessel.

ERYNGIUM, **SEA-HOLLY**, or *Eryngo*: A genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The flowers are collected into a round head, and the receptacle is paleaceous. There are nine species; most of which are hardy herbaceous perennials, producing erect stalks from one to two or three feet high; with simple, entire, or divided prickly leaves; and the stalks terminated by roundish aggregate heads of quinquepetalous flowers, of white, blue, or purple colours. They all flower mostly in July, and the seeds ripen in September. They are propagated by seeds sown in a bed or border, either in spring or autumn. The plants are to be removed the autumn after they come up, into those places where they are designed to remain. The leaves of one of the species (viz. the maritimum, which grows naturally on the sea-coasts of England and Scotland) are sweetish, with a light aromatic warmth and pungency. The roots are accounted aphrodisiac, and are ordered to be kept candied in the shops. The young flowering shoots eaten like asparagus are very grateful and nourishing.

ERYSIMUM, **HEDGE-MUSTARD**: A genus of the siliquosa order, belonging to the tetradynamia class of plants; and in the natural method ranking under the 39th order, *Sitiquosa*. The siliqua is long, linear, and exactly tetragonal; the calyx close. There are six species; of which the most remarkable is the officinale, hedge-mustard, or bank-crests. It grows naturally in Britain under walls, by the sides of highways, and among rubbish. It is warm and acrid to the taste; and when cultivated, is used as a vernal pot-herb. Birds are fond of the seeds; sheep and goats eat the herb; cows, horses, and swine refuse it. The seeds are said to promote expectoration, excite urine and the other fluid secretions, and to attenuate and dissolve viscid juices, &c. This they are supposed to perform by an acrimonious stimulating quality; but the taste discovers in them only an herbaceous softness void of acrimony: the seeds indeed are considerably pungent, and the roots in some small degree.

ERYSIPELAS, in medicine, an eruption of a fiery or acrid humour, from which no part of the body is exempted, though it chiefly attacks the face. See **MEDICINE-Index**.

ERYTHEA, or **ERYTHIA**, an island adjoining, according to the ancients, either to or a part of Gades; no where now to be found by the description given of

Eryman-
thus
||
Erythæa.

Erythra
Erythro-
nium.

it by ancient authors. The poets feign this to be the habitation of the fabulous Geryon, disarmed by Hercules, who drove away his cattle.

ERYTHRÆ (anc. geog.), a port town of Ætolia, on the Corinthian bay. Another Erythræ of Bœotia, near Plataea and mount Cithæron. A third Erythræ, a town of Ionia in the Hither Asia, situated in the peninsula, at its extremity, with a cognominal port. The Erythraeans laid claim to the Sibyl Herophile, as their country-woman, surnamed thence *Erythraea*. Erythræ was famous for an ancient temple of Hercules.

ERYTHRÆA, a town of Crete, situated in the fourth east of the island, at the promontory Erythræum.

ERYTHRÆUM MARE, erroneously called *Rubrum* by the Romans. Thus the ocean that washes Arabia and Persia, and extends a great way farther, is denominated. Hence it is, Herodotus says, that the Euphrates and Tigris fall into the Mære Erythræum. He also calls it the *South Sea*, on which the Persians dwell. It takes its name, not from its colour, the error of the Romans, who translated *Erythræum*, "Rubrum;" but from *Erythras*, son of Periclus and Andromeda, whose kingdom lay on the confines of that sea; whence its name *Erythræum*.

ERYTHRINA, CORAL-TREE: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is bilabiate, the one lip above, the other below; the vexillum of the corolla is very long and lanceolated. There are four species, all of them shrubby flowering exotics for the stove, adorned chiefly with trifoliate or three-lobed leaves, and scarlet spikes of papilionaceous flowers. They are all natives of the warm parts of Africa and America; and must always be kept in pots, which are to remain constantly in stoves in this country. They are propagated by seeds, which are annually imported hither from Africa and America. They are to be sown half an inch deep in pots of light rich earth, which are then to be plunged in the bark-bed of the stove; and when the plants are two inches high, they are to be separated into small pots, plunging them also in the bark-bed, giving them frequent waterings, and as they increase in growth shifting them into larger pots. The inhabitants of Malabar make sheaths of the wood, for swords and knives. They use the same, together with the bark, in making a sort of garments which they call *farassas*; and make of the flowers the confection *caryl*. The leaves pulverised and boiled with the mature cocoa-nut, consume venereal buboes, and ease pains in the bones; bruised and applied to the temples, they cure the cephalæa and ulcers: mixed with the sugar called *jagra*, they mitigate pains in the belly, especially in women; and the same effect follows from the use of the bark levigated with vinegar, or swallowing the kernel stripped of its red pellicle. The juice of the leaves taken with oil mitigates venereal pains; drank with an infusion of rice, it stops fluxes; made into a cataplasm with the leaves of betel, it destroys worms in old ulcers; and worked with oil, it cures the plica and itch.

ERYTHRINUS, in ichthyology, a species of *SERRIVUS*.

ERYTHROIDES, in anatomy, the first of the proper tunics or coats which cover the testicles.

ERYTHRONIUM, DOG'S-TOOTH VIOLET: A ge-

nus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The corolla is hexapetalous and campanulated; with a nectarium of two tubercles adhering to the inner base of every other petal. There is only one species, which, however, admits of several varieties in its flowers, as white, purple, pale red, dark red, crimson, and yellow. The plants are low and herbaceous, with a purple stalk and hexapetalous flowers. All the varieties are hardy and durable; and may be planted in small patches in borders, where they will make a good appearance. They rarely perfect their seeds in this country, but may be propagated by offsets. In Siberia, according to Gmelin, they dry and mix the root of this plant with their soups. It grows there in great abundance; and is called by the people of the country *besi*.

ERYTHROXYLON, in botany: A genus of the trigynia order, belonging to the decandria class of plants; and in the natural method ranking with those the order of which is doubtful. The calyx is tubenated; the petals of the corolla have each a nectariferous emarginated scale at the base; the stamina are connected at the base; the fruit a biculular plum.

ERYX, a son of Butes and Venus, who relying upon his strength, challenged all strangers to fight with him in the combat of the cestus. Hercules accepted his challenge after many had yielded to his superior dexterity; and Eryx was killed in the combat, and buried on the mountain, where he had built a temple to Venus. Virg. *Æn.* 5. v. 402. A mountain of Sicily near Drepanum, which received its name from Eryx, who was buried there. This mountain was so steep, that the houses which were built upon it seemed every moment ready to fall. Dædalus had enlarged the top, and inclosed it with a strong wall. He also consecrated there to Venus Erycina a golden heifer, which resembled life so much, that it seemed to exceed the power of art.

ERZERUM, or ERZERON, a city of Turkey in Asia, and capital of Armenia, or Turkomania. It is a pretty large town, five days journey from the Black Sea, and ten from the frontiers of Persia. It stands in a delightful plain, at the foot of a chain of mountains, which hinder the Fræ, or Euphrates, from falling into the Black Sea. A neighbouring hill supplies very fine springs, which not only water the fields, but the streets of the town. Erzerum is surrounded with double walls, defended by pentagonal towers; but the ditches are neither deep nor well kept up. The beglerbeg, or bathaw of the province, lives in the seraglio, which is very ill built. They reckon that there are 18,000 Turks at Erzerum, 6000 Armenians, and 10,000 Greeks. The Armenians have a bishop and two churches; and the Greeks have also a bishop, but the church is a miserable place. The last are mostly braziers, inhabiting the suburbs, who work the copper brought from the neighbouring mountains. They drive a great trade in copper utensils and furs, particularly martins skins. Five or six days journey from the town there are oaks that produce plenty of gall-nuts, which are brought hither. This place is the thoroughfare and resting place of all the merchants trading to the Indies, especially when the Arabs are watching for their prey round Aleppo and Bagdad. E. Long. 40. 50. N. Lat. 29. 46.

Erythroxylon
Erzerum.

Eschaddon

Eschara.

ESARHADDON, the son of Sennacherib, and his successor in the kingdom of Assyria. He is said to have reigned 29 years at Nineveh, from the year 3294 to 3321; besides which he reigned 13 years at Babylon, in all 42 years. He died in the year of the world 3336, and was succeeded by Sardanapalus. Esarhaddon, in the opinion of Sir Isaac Newton, seems to be the Sardanapalus who died, as Ctesarchus says, of old age, after the revolt of Syria; the name *Sardanapalus* being derived from *Esarhadon Pul*.

ESCALADE, or **SCALADE**, a furious attack of a wall or a rampart; carried on with ladders, to pass the ditch or mount the rampart; without proceeding in form, breaking ground, or carrying on regular works to secure the men.

When the troops are prepared to pass the ditch, either with the assistance of boards, hurdles, and fascines, when it is muddy, or with small boats of tin, or baskets covered with skins or oil-cloth, when it is deep and filled with water, a party must be placed on the counterescarp, opposite to the landing-place, ready to fire at the garrison if they are alarmed, and oppose the mounting on the rampart. If the ditch is dry, the ladders are fixed in some place farthest distant from the enemy; and as soon as they get upon the rampart, they put themselves in order to receive the enemy; if the enemy should be surprised and silently overcome, the detachment halts to break open the gate, and to let in the rest of the party. If the ditch is wet, the rampart high, and provided with a revetement, it will be difficult to surprise the town in this way; but if there is no revetement, the troops may hide themselves along the outside of the rampart till all are over. Since the invention and use of gunpowder, and the walls of cities have been flanked, they are seldom taken by escalade.

ESCALLONIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants. The fruit is bilocular and polyspermous; the petals distant and tongue-shaped; the stigma headed.

ESCAPE, in law; a violent or privy evasion out of some lawful restraint, without being delivered by due course of law. There are two sorts of escapes, voluntary and negligent. Voluntary, when a man arrests another for felony, or other crime, and afterwards lets him go freely by consent; in which case, the party that permits such escape is held guilty, committed, and must answer for it. Negligent escape, on the contrary, is where one is arrested, and afterwards escapes against the will of the person that arrested him, and is not pursued with fresh suit, and retaken before the person pursuing hath lost sight of him. By stat. 8 and 9 Will. III. c. 26. the keepers of prisons conniving at escapes shall forfeit 500*l*.; and in civil cases the sheriff is answerable for the debt.

ESCHALOT, or **SHALLOT**. See **ALLIUM**.

ESCHAR, in surgery, the crust or scab occasioned by burns or caustic medicines.

ESCHARA, in natural history, the name of a species of coralline, &c. the characters of which are these: they are of a stony or coral-like hardness, and resemble a woven cloth in their texture; and the microscope informs us, that they consist of arrangements of very small cells, whose surfaces appear much in that form.

Linnaeus makes it a species of millepora, in the class of lithophytes. See Plate CXLVIII. fig. 9. 10.

The narrow-leaved hornwrack, fig. 9. divides as it rises, into narrow leaves made up of regular rows of oblong square-shaped cells placed alternately by each other, and opposite to an equal number on the other side of the leaf, like an honeycomb; from these leaves proceed other still smaller foliaceous ramifications, many of which seem to be connected at the lower part by tubuli, as in the corallines; by which means they can ply to and fro more freely in the water.—*f*. Gives the natural appearance of this coralline. E represents two leaves with their tubuli and cells magnified. E 1 is a cross section of one of the leaves at E, showing the partition and inner form of their cells.

The broad-leaved hornwrack, fig. 10. when fresh taken out of the sea, is of a spongy soft texture, and smells very fishy; but when it has lain for some time on the shore, it becomes stiff and horny, like some sort of withered leaves. Both surfaces, when examined by glasses, appear to be covered with cells; and, when a piece of it is cut across, one may discover the thin membrane that serves as a base to the cells of each surface. The form of the cells is very remarkable, each one being arched at the top, and contracted a little at the lower part of the sides to make way for the arches of the two next adjoining cells; so that by this particular construction no room is lost. The entrance of the cells is immediately under the arch of each cell, and the walls of the cells seem to be fortified with spines. Justieu discovered small polypes extending themselves out of these cells, which he has described in the memoirs of the Academy of Sciences 1742.—*f*. Gives the natural appearance of a leafy branch of this coralline. F is a part of a leaf magnified to show the superficial figure of the cells, and the manner in which they are disposed. F 1 shows a cross section of a leaf, and discovers the several partitions of the cells.

At the entrance of many of the cells a small testaceous body like a bivalve shell is discovered: F 2, the figure of the cell, with the shell in it; it is of a transparent amber colour, so clear that one may see the dead animal through it, represented by the black spot.

ESCHEAT, in law, signifies any lands or tenements that casually fall to a lord within his manor. It is one of the consequences of tenure in chivalry: (See *FEODAL SYSTEM*, *KNIGHT-SERVICE*, and *TENURE*). It is the determination of the tenure or dissolution of the mutual bond between the lord and tenant, from the extinction of the blood of the latter by either natural or civil means; if he died without heirs of his blood, or if his blood was corrupted and stained by commission of treason or felony; whereby every inheritable quality was entirely blotted out and abolished. In such cases the land escheated or fell back to the lord of the fee; that is, the tenure was determined by breach of the original condition, expressed or implied in the feudal donation. In the one case, there were no heirs subsisting of the blood of the first feudatory or purchaser, to which heirs alone the grant of the feud extended: in the other, the tenant, by perpetrating an atrocious crime, showed that he was no

Eschara,
Escheat.

Escheat
||
Escouade.

longer to be trusted as a vassal, having forgotten his duty as a subject; and therefore forfeited his feud, which he held under the implied condition that he should not be a traitor or a felon. The consequence of which in both cases was, that the gift being determined, refunded back to the lord who gave it.

The word *escheat* is sometimes used for the place or circuit within which the king or other lord is intitled to escheats; also for a writ to recover the same from the person in possession after the tenant's death.

ESCHEAT, in Scots law, is that forfeiture which is incurred upon a person's being denounced a rebel. See *Law*, Part III. N. clxvi. 12.

ESCHEVIN, or ECHEVIN (*Scabins*), in the French and Dutch polity, a magistrate elected by the inhabitants of a city, to take care of their common concerns, the good order, conveniency, and decoration of the city, &c.

At Paris there is a prevot and four *eschevins*; in most other cities a mayor and *eschevins*. In Languedoc, Provence, and Dauphiné, they are called *consuls*; at Toulouse, *capitouls*; and *jurats* at Bourdeaux.

Anciently the *eschevins* were the assessors and counsellors of the comites or judges of cities; on which account they were called in some places *pares*, *parres*; they even took cognizance of petty causes themselves.

Du-Cange observes, that the judges and their assessors, who were chosen by the inhabitants, were called *scabini* "eschevins," and their college *scabinagium* or "eschevinage."

In Holland, the *scabins* or *eschevins* judge of all civil affairs at first hand. They also take cognizance of criminal matters: and if the criminal confesses himself guilty, they can see their sentence executed without appeal. They can even give torture. The number is not the same in all cities; at Amsterdam there are nine, at Rotterdam seven, &c.

ESCHRAKITES, or ESRAKITES, a sect of philosophers, among the Mahometans, who adhere to the doctrines and opinions of Plato. The word is derived from the Arabic *فمضجبراعا*, which in the fourth conjugation *فمضجبراعا*, signifies "to shine, glitter like the sun;" so that *Eschrakite* seems to import "illuminated."

The *Eschrakites*, or Mahometan Platonists, place their highest good and happiness in the contemplation of the Divine Majesty; despising the gross imaginations of the Alcoran touching paradise. They are very careful in avoiding all vice; they preserve an equal and easy temper, love music, and divert themselves with composing little poems or spiritual songs. The shaicks or priests, and the chief among the preachers of the imperial mosques, are *Eschrakites*.

ESCLAIRCISSEMENT, a French term adopted into our language, signifying the explaining or clearing up of some difficulty or obscurity.

ESCORT, a French term, sometimes used in English authors, to denote a convoy or company of armed men, attending some person or thing, in a journey or voyage, to defend or secure it from insults. Some derive the word from the Latin *cohors*.

ESCOUADE, or SOUAD, is usually the third or fourth part of a company of foot; so divided for mounting guards, and for the more convenient re-

lieving of one another. It is equivalent to a brigade of a troop of horse. See *BRIGADE*.

ESCUAGE, in our old customs, a kind of knight-service, called *service of the shield*, by which the tenant was bound to follow his lord to the wars at his own charge. See the articles *CHIVALRY*, *FEDAL System*, and *KNIGHT-Service*.

ESCULAPIUS. See *ESCULAPIUS*.

ESCULENT, an appellation given to such plants or the roots of them as may be eaten: such are beets, carrots, artichokes, leeks, onions, parsnips, potatoes, radishes, scorzonera, &c.

ESCURIAL, a royal residence of Spain, situated about 15 miles north-west of Madrid. It is the largest and most superb structure in the whole kingdom, and perhaps one of the finest in Europe. The word is Arabic, meaning "a place full of rocks." It is built in a dry barren spot, surrounded with rugged mountains, inasmuch that every thing which grows there is owing to art. This place was chosen, it is said, for the sake of the stone wherewith the fabric is built, which is got from a mountain just by, and is very durable; and the design of erecting it was to commemorate a victory which Philip II. obtained over the French (but by the assistance of the English forces) at St Quintin, on St Laurence's day, in the year 1557. The Spanish description of this structure forms a sizeable quarto volume, and it is said that its founder expended upon it six millions of ducats. The apartments are decorated with an astonishing variety of paintings, sculpture, tapestry, ornaments of gold and silver, marble, jasper, gems, and other curious stones, surpassing all imagination. This building, besides its palace, contains a church, large and richly ornamented; a mausoleum; cloisters; a convent; a college; and a library, containing about 30,000 volumes; besides large apartments for all kinds of artists and mechanics, noble walks, with extensive parks and gardens, beautified with fountains and costly ornaments. The fathers that live in the convent are 200, and they have an annual revenue of 12,000*l*. It was begun by Philip in 1562, five years after the battle; and completed in 22 years. It consists of several courts and quadrangles, which altogether are disposed in the shape of a gridiron, the instrument of the martyrdom of St Laurence; the apartment where the king resides forms the handle. The building is a long square of 640 by 580, and the height up to the roof is all round 60 feet, except on the garden side, where the ground is more taken away. At each angle is a square tower 200 feet high. The number of windows in the west front is 200; in the east front 366. The orders employed are Doric and Ionic. There are three doors in the principal front. Over the grand entrance are the arms of Spain, carved in stone; and a little higher in a niche, a statue of St Laurence in a deacon's habit, with a gilt gridiron in his right hand, and a book in his left. Directly over the door is a basso relievo of two enormous gridirons in stone. This vast structure, however, with its narrow high towers, small windows, and steep sloping roof, exhibits a very uncouth style of architecture; at the same time that the domes, and the immense extent of its fronts, render it a wonderfully grand object from every point of view. The church, which is in the centre of all, is large,

Escuage
||
Escorial.

Escutcheon, large, awful, and richly but not affectedly ornamented. The cupola is bold and light. The high altar is composed of rich marbles, agates, and jaspers of great rarity, the produce of this kingdom. Two magnificent *catafalques* fill up the side arcades of this sanctuary: on one the emperor Charles V. his wife, daughter, and two sisters, are represented in bronze, larger than life, kneeling; opposite are the effigies of Philip II. and of his three wives, of the same materials, and in the same devout attitude. Undereath is the burial-place of the royal family, called the *Pantheon*. Twenty-five steps lead down to this vault, over the door of which is an inscription, denoting, that

Hic locus, sicut mortalitatis exuvie Catholicoorum Regum, &c.

was intended by Charles the emperor, resolved upon by Philip II. begun by Philip III. and completed by Philip IV. The mausoleum is circular, 36 feet diameter, incrustured with fine marbles in an elegant taste. The bodies of the kings and queens lie in tombs of marble, in niches, one above the other. The plan of these sepulchres is grand, and executed with a princely magnificence; but, as a modern traveller observes, in a style rather too gay, too light, and too delicately fitted up for the idea we are apt to form of a chapel destined for the reception of the dead. The collection of pictures dispersed about various parts of the church, sacristy, and convent, has been considered as equal, if not superior, to any gallery in Europe except that of Dresden. Formed out of the spoils of Italy, and the walled cabinet of that unfortunate diletante Charles I. of England, it contains some of the most capital works of the greatest painters that have flourished since the revival of the art. In the sacristy is an altar called *La Janta Forma*: this is a kind of tabernacle or *custodia* of gems, marbles, woods, and other precious materials, inlaid in gilt bronze; in which, rather than in the excellence of the workmanship or taste of the design, consists the merit of this rock of riches. Before it hangs a curtain, on which Coello has represented Charles II. and all his court in procession, coming to place this *Forma*. This is esteemed one of the most curious collections of portraits in the world; for all the persons are drawn with the greatest strength of colour and truth of expression, and are said to be perfect resemblances not only of the monarch and grave-diggers, but even of the monks, servants, and guards. The statues, busts, and medallions of the Escutrial, are not in any great number, nor very remarkable for their excellence: but the library contains a most precious collection of manuscripts, many fine drawings, and other curiosities. Notwithstanding the coldness of the exposure, the late king, for the sake of hunting, used to pass here several months of the year; and to make the place less inconvenient to his attendants and the nobility, he built an entire new town adjoining to it.

ESCUTCHEON, or SCUTCHEON, in heraldry, is derived from the French *escussions*, and that from the Latin *scutum*, and signifies the shield whereon coats of arms are represented.

Most nations of the remotest antiquity were wont to have their shields distinguished by certain marks painted on them; and to have such on their shields was a token of honour, none being permitted to have them till they had performed some honourable action.

The escutcheon, as used at present, is square, only rounded off at the bottom.

ESDRAS, a Jewish priest, and doctor of the law. Artaxerxes Longimanus sent him with rich presents for the use and ornament of the temple at Jerusalem, rebuilt under Zerubbabel; the king also ordered the neighbouring governors to provide him with what conduced to the pomp of the Jewish religion, and to exempt the priests from paying taxes. He is supposed to be the collector of the Canon of Scripture; and that, by divine inspiration, he added some things which happened after the deaths of the authors. It is guessed he wrote the Chronicles, besides those books which bear his name, the two last of which are exploded even by the church of Rome.

ESK, the name of several rivers both in England and Scotland, particularly of one which forms part of the boundary between the two kingdoms. It runs from north-east to south-west, and gives name to the county of Eskdale.

ESKI-HISSAR. See **STRATONICEA**.

ESKIMAU. See **ESQUIMAUX**.

ESNE, a considerable sea-port town of Upper Egypt. It is governed by an Arabian prince, and by a cahef, dependant on the bey of Girze. The Mahometans have several mosques here, and the copts a church served by two priests. "Esne (says Abulfeda), remarkable for its public baths and its commerce, is built on the westward of the Nile, between Assuan and Cous, but nearer to this latter. It acknowledges, adds the geographer of Nubia, the copts for founders. Its well cultivated territory abounds in grain and palm trees. It is surrounded by gardens filled with fruit trees. One admires here several ancient monuments constructed by the copts, and superb ruins." This description answers to Esne in our time, which is situated on the edge of a rich country, and shaded by groves of orange trees loaded with fruits and flowers. This town, formerly called *Lato-polis*, revered Minerva and the fish *Latus* (Strabo). It contains within its boundary an antique temple; thick walls inclose it on three sides. Six large fluted columns, crowned by a capital ornamented with the palm leaf, form the facade of it; 18 others support the roof, which is composed of large squares of marble; the building is surrounded by a freeze, and innumerable hieroglyphics cover its exterior aspects.

A little to the south of the town are seen the ruins of a monastery founded by St Helena, and near it the burying place of the martyrs, adorned with tombs crowned by cupolas, supported by arcades. The inhabitants of Esne having revolted against the persecution of Dioclesian, that emperor destroyed this town and put them to the sword. This place, consecrated by religion, is become a celebrated pilgrimage among the Copts. They repair thither from the most distant provinces of the kingdom. In the chain of mountains which stretches to the eastward of the Nile, and nearly opposite Esne, are quarries of a soft stone, called *Baram*. It is made use of for kitchen utensils. It hardens in the fire, and forms excellent kettles and pans, which give no bad taste to the victuals.

ESOX, in ichthyology, a genus of fishes belonging to the order of abdominales. The body is elongated; the head is plainish above; the upper jaw is plain, and

Esdras
||
Esne.

Efor.

and shorter than the under one, which is dotted; and the branchiostegic membrane has from seven to twelve rays.

1. The **LUCIUS**, or **PIKE**, has a flat head: the upper jaw is broad, and shorter than the lower: the under jaw turns up a little at the end, and is marked with minute punctures. The teeth are very sharp, disposed only in the front of the upper jaw, but in both sides of the lower; in the roof of the mouth, and often in the tongue. The slit of the mouth, or the gape, is very wide; the eyes small. The pike is common in most of the lakes of Europe; but the largest are those taken in Lapland, which, according to Scheffer, are sometimes eight feet long. They are taken there in great abundance, dried, and exported for sale. The largest fish of this kind said to be caught in England, weighed 35 pounds. All writers who treat of this species bring instances of its voraciousness. It hath been known to choke itself by attempting to swallow one of its own species which proved too large a morsel. Yet its jaws are very loosely connected, and have on each side an additional bone like the jaw of a viper, which renders them capable of greater distension when it swallows its prey. It does not confine itself to feed on fish and frogs; it will devour the water-rat, and draw down the young ducks as they are swimming about. But there are instances of its fierceness still more surprising, and which indeed border a little on the marvellous. Gesner relates, that a famished pike in the Rhone, seized on the lips of a mule that was brought to water, and that the beast drew the fish out before it could disengage itself; that people have been bit by these voracious creatures while they were washing their legs; and that the pike will even contend with the otter for its prey, and endeavour to force it out of its mouth. Small fishes show the same uneasiness and detestation at the presence of this tyrant, that the little birds do at the sight of the hawk or owl. When the pike lies dormant near the surface, as is frequently the case, the lesser fishes are often observed to swim around it in vast numbers and in great anxiety. Pikes are often haltered in a noose, and taken while they thus lie asleep, as they are often found in the ditches near the Thames, in the month of May. In the shallow water of the Lincolnshire fens they are often taken in a manner, we believe, peculiar to that country and to the island of Ceylon. The fisherman makes use of what is called a *crown net*; which is no more than a hemispherical basket, open at top and bottom. He stands at the end of one of the little fen-boats, and frequently puts his basket down to the bottom of the water; then poking a stick into it, discovers whether he has any booty by the striking of the fish; and vast numbers of pike are taken in this manner. The longevity of this fish is very remarkable, if we may credit the accounts given of it. Raczynski tells us of one that was 90 years old; but Gesner relates, that, in the year 1497, a pike was taken near Hailbrun in Suebia, with a brazen ring affixed to it, on which were these words in Greek characters: "I am the fish which was first put into this lake by the governor of the universe, Frederick the Second, the 5th of October 1230." So that the former must have been an infant to this Methusalem of a fish. Pikes spawn in March or April, accord-

ing to the coldness or warmth of the weather. When they are in high season, their colours are very fine, being green, spotted with bright yellow; and the gills are of a moist vivid and full red. When out of season, the green changes to a grey, and the yellow spots turn pale.

2. The **BELONE**, or **GAR**, sometimes grows to the length of three feet or more. The jaws are very long, slender, and sharp-pointed: the under jaw extends much farther than the upper; and the edges of both are armed with numbers of short and slender teeth: the tongue is small: the eyes are large; the irides silvery; the nostrils wide and round. The body is slender, the belly quite flat, bounded on both sides by a rough line. The tail is much forked. The colours are extremely beautiful when the fish is in the water: the back is of a fine green, beneath which appears a rich changeable blue and purple; the sides and belly are of a fine silvery hue. This fish, which is found in many places, is known by the name of the *sea-needle*. It comes in shoals on our coasts in the beginning of summer, and precedes the mackerel: it has a resemblance to it in taste; but the light green which stains the back-bone of this fish gives many people a disgust to it.

3. The **SAURUS**, or **SAURY**, is 11 inches in length: the nose slender; the jaws produced like those of the sea-needle, but of equal length: the eyes large: the body anguilliform; but towards the tail grows suddenly smaller, and tapers to a very inconsiderable girth. The tail is much forked: the back dusky: the belly bright and silvery. Great numbers of these fish were thrown ashore on the sands of Leith near Edinburgh, after a great storm in November 1768. Rondeletius describes this species among the fish of the Mediterranean; but speaks of it as a rare kind.

4. The **BARRACUDA** of Cateby, is found in great numbers about the seas of the Bahamas and as far as Jamaica. Its body and head very much resemble the European pike: the eyes are large: the mouth is very wide: the under jaw longer than the upper: there are four very large and sharp teeth in the front of the upper jaw; in that of the lower, a single great and sharp tooth: there are two dorsal fins: the tail is large and forked: colour a deep brown, whitish on the belly. It grows to the length of 10 feet. It swims exceedingly swift, and is of dreadful voracity: will attack and devour men when they are bathing. The flesh has a disagreeable smell and taste, and is frequently poisonous; causing great sickness, vomiting, intolerable pains in the head, and loss of hair and nails: yet the hungry Bahamans formerly were under the necessity, at times, of feeding on it.

ESPALIERS, in gardening, are rows of trees planted about a whole garden or plantation, or in hedges, in such a manner as to inclose quarters or separate parts of a garden; and are trained up regularly to a lattice of wood-work in a close hedge for the defence of tender plants against the injuries of wind and weather. They are of admirable use and beauty in a kitchen garden, serving not only to shelter the tender plants, but screen them from the sight of persons in the walks.

The trees chiefly planted for espaliers, are apples, pears, and some plums: some plant apples grafted upon paradise-stocks: but as these are of short duration, it is better to plant those grafted upon crabstock, or upon

Efor.

Espaliers.

upon what the gardeners call *Dutch stocks*; which will both cause them to bear sooner, and prevent their growing too luxuriant. The best kind of apple for this purpose, are the golden pippin, nonpareil, rennet, &c. and the best sort of pear, are the jargonelle, blanquette, &c. These last, if designed for a strong moist soil, should be grafted upon quince-stocks; but if for a dry soil, upon free-stocks.

While the trees are young, it will be sufficient to drive a few stakes into the ground on each side of them; fastening the branches to these in an horizontal position, as they are produced. This method will do for the three first years; after which an espalier should be made of stakes, whereof there must be two sorts, larger and smaller; the former to be driven upright into the ground a foot asunder, and the latter, or slender poles, to be nailed across these, at about nine inches. Some prefer to this another sort of espalier, made of square timber cut to any size: these are, indeed, more slightly, but withal vastly more expensive.

When the espalier is thus framed, the branches are to be fastened to it with other-twigs; observing to train them in an horizontal position, and at equal distances. Fruit-trees thus managed are preferable to any others; not only as bearing better-tasted fruit, but as taking up very little room in a garden, so as to be less hurtful to plants which grow in the quarters.

ESPLANADE, in fortification, the sloping of the parapet of the covered-way towards the campaign.

ESPLEES, in law, the general products which lands yield, or the profit or commodity that is to be taken or made of a thing.

ESPOUSALS, in law, signify a contract or promise made between a man and a woman to marry each other; and in cases where marriages may be consummated espousals go before. Marriage is termed an *espousal de presenti*.

The espousals amongst the Jews were either by writing, or by a piece of silver given and received, or by cohabitation. Amongst the Greeks, after the parents and friends of the young couple had finished their negotiation, the couple themselves pledged their faith to each other, the man swearing that he would be constant and true, the woman that she would marry him, and make him master of all she had. Then they ratified their agreement by a kiss and joining right hands.

Amongst the Romans the espousals consisted in an engagement of friends on both sides, whether absent or present, in public or without witnesses. But the common way was by writings drawn up by common consent, and sealed by both parties; besides this, the man sent a ring to the woman, consisting of iron and without a stone.

ESQUILÆ (anc. geogr.), one of the seven hills of Rome, which Varro will have to be two, viz. Cispinus and Oppius; also Mons Esquilinus, softened from Esquilinus; and this again from Excubinus, the watch or guard Romulus kept here, from a jealousy he entertained of his colleague Titus Tatius. On the east side it reached the city walls; on the south, the Via Laticana; on the west, the wide valley between mount Coelius and the Palatine; on the north, the Mons Viminalis; on the east side was the Porta Esquilina. This hill by some of the ancients was called *Suburranus*, from the

street *Suburra* to the north of it: by the poets, *Esquilina*.

ESQUIMAUX, a people of North America inhabiting all that vast tract of land known by the name of *Labrador*, or *New Britain*.—They differ very considerably, both in aspect and behaviour, from the other American nations; agreeing in most respects with the inhabitants of West Greenland. See *NEW BRITAIN*, and *GREENLAND*.

ESQUIRE (from the French *escu*, and the Latin *scutum*, in Greek *εσχυρ*, which signifies an hide, of which shields were anciently made, and afterwards covered; for, in the time of the Anglo-Saxons, the shields had a covering of leather), was originally he who, attending a knight in time of war, did carry his shield; whence he was called *escuyer* in French, and *scutifer*, or *armiger*, i. e. armour-bearer, in Latin. Hotoman says, that those whom the French call *esquires*, were a military kind of vassals, having *jus scuti*, viz. liberty to bear a shield, and in it the ensigns of their family, in token of their gentility or dignity. But this addition hath not of long time had any relation to the office or employment of the person to whom it hath been attributed, as to carrying of arms, &c. but hath been merely a title of dignity, and next in degree to a knight. For those to whom this title is now due, see the article *COMMONALTY*. Officers of the king's courts, and of the king's household, counsellors at law, justices of the peace, are only *esquires* in reputation; and he who is a justice of peace has this title only during the time he is in commission, and no longer, if he is not otherwise qualified to bear it. A sheriff of a county being a superior officer, bears the title of *esquire* during his life; in respect of the great trust he has in the commonwealth. The chief of some ancient families are *esquires* by prescription; and in late acts of parliament for poll-money, many wealthy persons commonly reputed to be such, were ranked among the *esquires* of this kingdom.

There is a general opinion, that every gentleman of landed property who has L.300 a-year, is an *esquire*; which is a vulgar error: for no money whatsoever, or landed property, will give a man properly this title, unless he comes within one of the above rules; and no person can ascribe this title where it is not due, unless he pleases; there being no difficulty in drawing the line by the accounts given above and in the article *COMMONALTY*: but the meaner ranks of people, who know no better, do often basely prostitute this title; and, to the great confusion of all rank and precedence, every man who makes a decent appearance, far from thinking himself any way ridiculed by finding the superscription of his letters thus decorated, is fully gratified by such an address.

ESQUIRES of the King, are such as have that title by creation, wherein there is some formality used, as the putting about their necks a collar of SS, and bestowing on them a pair of silver spurs, &c.

ESRAKITES. See *ESCHRAKITES*.

ESSAY, a trial or experiment for proving the quality of any thing; or an attempt to learn, whether or not any invention will succeed.

ESSAY, in literature, a peculiar kind of composition, the character whereof is to be free, easy, and natural;

¹ **Effaying.** tural; not tied to strict order or method, nor worked up and finished like a formal system.

ESSAYING, or ASSAYING, in chemistry and metallurgy, signifies the examination of a small quantity of any ore or mineral by fire, in order to discover its contents. This is very necessary for those who intend to deal largely in metallurgic operations, in order to avoid unnecessary expence, by becoming previously acquainted with the nature of the ore.

² **History of the art.** The first attempts in this way were no doubt extremely rude; but succeeding trials have advanced it to the form of a science or art practised by numbers of people under the title of *essay-masters*. No treatise was published on this subject till after the middle of the 16th century; and the first book we have upon it is attributed to Lazarus Ercker, which appeared in 1574. Agricola, however, in his seventh book *De re Metallica*, published in 1576, described both the instruments and processes, illustrating the whole with plates; and there is incontestable evidence that this treatise had been presented to the elector of Saxony in 1567, tho' it did not appear to the world till after the publication of Ercker's book. Since that time, the art has been greatly improved; but the operations in the dry way are not materially different from those described under **METALLURGY**. The **BLOW PIPE** likewise affords an excellent method of examining small quantities of metal in the dry way; but the greatest improvement hitherto made in it is that of *effaying* by the moist way introduced by Mr Bergman.

³ **Requisites for effaying in the dry way.** This celebrated chemist observes, that in the *Doci-massa Siccæ*, or *effaying* in the dry way, three things are requisite: 1. That the metal contained in the ore be all reduced to a complete form; for such part of it as is deficient in that respect cannot be united with the efficated metal. 2. That the whole be collected into one mass; for when it is dispersed in numerous small grains, some of them are very easily scattered, and diminish the weight. 3. That the metallic form be preserved; for the extracted regulus must inevitably be diminished more or less by calcination. All these requisites are frequently effected conveniently enough in a crucible by fusion with proper strata of charcoal, provided the ore is free from sulphur and other volatile mixtures, and is entirely without a matrice, or united to one that can be melted by a moderate degree of heat; but if the matrice be refractory, notwithstanding the most subtle pulverisation, it will cover many of the metallic particles, and thus the reduction and fusion will be in some measure prevented. When this happens to be the case, we must add such other substances as not only promote fusion, but make the matter flow sufficiently thin to allow the reguline particles to fall to the bottom. These substances, which from the effect they have on the matter are called *fluxes*, are of a saline nature, and must therefore necessarily corrode the metals more or less; and hence the scoria, which are almost always tinged, contain a quantity of calcined metal. But as long as we are destitute of a sure method of measuring intense degrees of heat, and as long as it is necessary to perform the operation

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in close vessels to prevent the access of air, the force and proper continuance of the fire will be uncertain (A). Now, by every excess or defect in this point some part of the regulus is lost; so that any judgment of the goodness of the ore, formed from the weight of the regulus, must be fallacious, or at least somewhat inaccurate.

Here we may understand, that experiments upon ores made in the dry way, are liable to many faults and imperfections; to which we may add the following, viz. way of effaying. That a given quantity of ore subjected to trial almost always exceeds in weight the regulus to be extracted from it. Now, since it is impossible to avoid a certain loss both during calcination and fusion, this loss will be the more remarkable, as the mass to be weighed becomes ultimately lighter. The case is quite otherwise with experiments made in the moist way; for here the weighty sediment, from which the quantity of the contents is judged, is never less, but often greater, than that obtained by fire.

⁵ In the attempts made to *effay* ores in the humid way previous to those of Mr Bergman, both methods were used, the metallic part being extracted by a menstruum, and afterwards reduced by fire. Our author, however, has now shown a method of performing the operation without either calcination or fusion. "It must indeed be confessed (says he), that experiments in the humid way often require more care and pains than the other; but if accurate conclusions are thereby obtained, we ought not to grudge the slowness. Besides, in many cases this method is more expeditious than the other; and indeed almost always, if we content ourselves with such discoveries as can be made by the common calcinations and fusions: nay, sometimes the dry method is obviously insufficient, when the metallic content is either very small or volatile; but particularly if it be inflammable, as is the case with zinc."

⁶ In this method the ores to be examined should be reduced to a very subtle powder by pulverization and calcination. In dissolving such ores as contain sulphur, we ought to employ the vitriolic or marine acid; for the nitrous, by long continued heat, destroys the sulphur. Too great heat also dissipates some of it in vapours, or melts it into globules containing heterogeneous matters; therefore boiling ought to be avoided where it can be done. All the precipitates must be carefully collected, washed, and dried. Distilled water ought constantly to be used, and all the menstrua carefully depurated. Vitriolic acid our author calls *diluted*, when its specific gravity is below 1.3, the nitrous when below 1.2, and the marine when below 1.1. The precipitations should be carefully made in glass vessels; so that nothing may remain either through the deficiency of the precipitant, or be redissolved through its too great quantity. The clear liquor is to be decanted from the precipitate, water poured on in its place, the vessel shaken, and then suffered to stand; the water again decanted off, and more poured on in its stead, until it will no longer affect certain precipitants by which it must be examined. The sediment is then to be collected on a filter, the latter being previously weighed,

(A) The newly-invented thermometer of Mr Wedgewood has furnished us with a method of measuring intense degrees of heat; but we have not yet heard how far this has been found useful in practice.

⁷ Effaying weighed, and made of paper not impregnated with alum. It is to be dried at first with a gentle heat, but afterwards exposed for five minutes to a heat of 100°. On cooling, it is to be weighed together with the filter; the known weight of which must afterwards be subtracted. The sediment is best washed in a bottle; for a filter when once impregnated with saline matter cannot be freed from it again without great difficulty, especially if an interval of some hours intervenes.

⁷ The alkali made use of in Mr Bergman's experiments, was that of soda saturated with aerial acid. His phlogisticated alkali is made by deflagrating equal weights of pure nitre and cream of tartar intimately mixed together; the residuum is the common white flux. Half an ounce of this is dissolved in half a quadrans of distilled water. To this he adds, in a digesting heat, two ounces of Prussian blue, carefully avoiding such an effervescence as may throw any thing over, which easily happens if the quantity be too large. The pigment soon loses its beautiful blue colour, growing not red but black; which shows that a decomposition has taken place. The Prussian blue used in his experiments contained in 100 parts only 23 of the pigment and 77 of the clay; so that if we employ the blue made without any alum, 221 grains of it will saturate the half ounce of alkaline salt more completely than the two ounces of the kind already described. But in whatever manner the operation is performed, after the addition of the salt quantity, the whole must be exposed to a stronger digesting heat, and stirred with a wooden spatula. If the liquor be too much diminished by evaporation, the defect must be supplied by adding more water. When the liquor becomes clear, the residuum must be collected upon filtering paper, and gradually washed with warm water until all the soluble part is extracted; when, if the operation has been properly conducted, the filtered liquor amounts to a whole quadrans, of a brownish yellow colour, and so well saturated with colouring matter, that it does not change the colour of paper tinged with Brazil wood. This lixivium, however, contains a small quantity of Prussian blue, about 4 lb. to a cwt. of the alkali. These should be previously separated by an acid, or, which is better, corrected by subtracting from the weight of the sediment 16 effay pounds for each quadrans of the lixivium. When we wish to examine the colour of the precipitate exactly, however, the lixivium we employ must necessarily be well deputed; for by neglecting this precaution we may easily persuade ourselves that any metal precipitated by the lixivium has a blue colour. When we only wish to ascertain the weight, the lixivium, having the small proportion of Prussian blue intermixed, may be employed: but still the proper correction must ultimately be made use of; for the precipitating acid is wont to impair the qualities of the lixivium, and even to destroy them altogether, especially in a warm temperature. Calcareous earth, whether in its mild or caustic state, is also capable of abstracting a coloured substance from iron and other metals.

⁸ In the precipitation of metals by metals, it is to be observed, that the acid of the solution ought to be somewhat predominant; but any considerable excess must be corrected afterwards, either by alkali, water, or spirit of wine.

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In the following experiments an essay cwt. was al-⁹ Effaying¹⁰ ways employed, unless where it is expressly mentioned otherwise: conclusions sufficiently accurate may indeed be obtained from 25 lb. nay sometimes from smaller quantities. In these cases our author mentions Bergman's the usual quantity; applying to them those formulæ of calculation which are founded on the mutual proportions of the proximate principles constituting metallic salts. By an easy substitution, the same formulæ may be used by those who employ $\frac{1}{2}$ or $\frac{1}{4}$ cwt. We now come to describe the method of effaying the ores of the particular metals.

¹⁰ 1. *Ores of Gold.* This metal occurs in the bowels of the earth native, possessing a complete metallic form, although in general the small particles of it are so interperfered in various matrices, that they are entirely invisible. It is also found mineralized, or united with sulphur by means of iron or some other metal. These two species of ore we shall consider separately.

¹¹ Native gold is very seldom, if ever, free from heterogeneous matters; the most usual mixtures are copper, silver, and sometimes iron. The first of these remains in the menstruum, and may be separately collected by dissolving the gold in aqua regia, and precipitating it by martial vitriol: the second falls during the solution, yielding a faluted silver; which, being washed and dried, shows the weight of the silver contained; and the iron may be discovered by phlogisticated alkali. The precipitate occasioned by martial vitriol is pure gold in its metallic state, but very subtly divided, and therefore its weight requires no correction.

Hence it appears how small a portion of gold inherent in the ores of other metals may be extracted; besides, a solution containing the most minute particle of gold instantly produces the purple precipitate of Cassius, with a solution of tin properly prepared.

¹² As to the ore which contains gold adhering to and surrounded by stony particles, 1. We must reduce a determined weight to an impalpable powder by triture and elutriation. Then let the powder, weighed a second time, be boiled in aqua regia, as long as any thing is taken up by the menstruum; after which, let the exhausted ore, well washed, be collected, excicated to ignition, and weighed. Let the clear solution (the colour of which, in some degree, affords a method of judging) be precipitated in the usual way by martial vitriol; the precipitate well washed, dried, and weighed, shows the gold, which, added to the weight of the exhausted ore, ought to be equal to the original weight, unless somewhat has been dispersed by the pulverisation, or unless some of the matrice has entered the menstruum. The former of these is discovered by comparing the weights before and after pulverisation; the latter by precipitants.

When grains of gold are mixed with loose earthy particles, they are sometimes easily separated by mechanical application of water.

¹³ When the metal is mineralized by sulphur, as in the golden pyrites, let one or more essay cwt. reduced to powder be gently boiled in the nitrous acid, or rather sulphur, digested in a heat of 50°—80°, lest the sulphur should be destroyed. It is even necessary to employ a more gentle heat for this purpose, that the sulphureous particles,

Effaying.

ticles, gradually separating, may remain in their natural state; for if they melt, the heterogeneous particles, which ought to have been removed, will be inclosed in the melted mass. The menstruum ought to be added in several portions, about six times the quantity of the ore at each turn. The pyrites is acted upon by this menstruum; an effervescence ensues, which continues for some time; after which a fresh quantity of the acid is to be added, until the sulphur is obtained pure and of its proper colour. From 12 to 16 parts of the acid are usually required to one of the ore. The purity of the sulphur is easily ascertained by caustic alkali.

The matrice, if insoluble in the menstruum, remains at bottom, together with the gold; which is distinguished by its peculiar colour and splendor, and may be separated from the matrice by careful elutriation. The particles of gold assume the form of very small grains, yet such as have angular points discernible by a good eye; and their appearance gives some reason for supposing that they have rather been intimately mixed with the pyrites than dissolved in it. The clear solution, which is generally green, must be evaporated, made red hot, and then weighed. Any other metals that happen to be present besides iron, may be extracted by suitable menstrua; as copper by the volatile alkali, manganese by dilute nitrous acid, with the addition of a little sugar: zinc is scarce ever met with in gold pyrites; but if it should happen to exist, may be extracted by any menstruum; and silver by pure nitrous acid. Calcareous earth, when it happens to form the matrice, unites with nitrous acid, and clay with that of vitriol. The sum of the weights of all the ingredients ought to be equal to the original weight of the ore; and unless any loss has been sustained during the operation, any deficiency may be attributed to the consumption of the sulphur.

14
Of platina.

2. *Ores of Platina.* The only metal with which platina is known to be alloyed is iron. This may be separated in a great measure by boiling the grains of platina, reduced to as fine a powder as possible, in marine acid, by which the original weight of the grains is generally reduced by about 0.05 of the whole. The depurated platina, dissolved in aqua-regia, easily discovers itself by precipitation with martial vitriol, if any gold be present: and, on the other hand, if platina contains a small quantity of gold, the latter may be discovered by any neutral salt containing vegetable or volatile alkali.

15
Of silver,

3. *Ores of Silver.* This metal, when found in its native state, is generally alloyed with gold or copper, or both. The silver and copper will be taken up by nitrous acid, leaving the gold at bottom in the form of a black powder, which may be made to assume a more metallic appearance by solution in aqua-regia and precipitation by martial vitriol. The copper remaining in the solution may then be collected by means of iron or aerated alkali.

16
Mineralized by various substances.

Silver united with sulphur alone (the glassy ore of silver) is of a black colour. To discover the contents of this ore, let it be divided and powdered as much as possible, and then gently boiled for an hour in 25 cwt. of diluted nitrous acid: then after decanting the liquor, the operation is to be repeated with an equal quantity of the menstruum; and even a third time, unless the pure sulphur be now separated. The last particles of

the silver adhere obstinately to the sulphur. If any gold be present, it remains undissolved at the bottom of the vessel. The decanted liquors being collected, are to be deprived of the silver by adding common salt; then if we suppose the precipitate when collected, washed, and dried, to be $\frac{100a}{120}$, the silver required will be $\frac{100a}{120}$. The weight of the sulphur added to the

above ought to be 100 lb. if the operation has been rightly performed, and no decomposition of the sulphur taken place. The clear liquor, which passes in filtering the luna cornea, easily discovers any other metal which may originally have been mixed with the silver; after which, the earth may be precipitated by means of a common fixed alkali.

It is difficult to separate the remains of the matrice from the sulphureous particles. To effect this, however, let the sum of the weights be first observed; then pour on caustic lixivium, which will dissolve the sulphur by a gentle digesting heat; the matrice then remains alone, and by its weight we can determine that of the sulphur; but we must not continue the digestion longer than is necessary to dissolve the sulphur, lest some of the siliceous earth should also be taken up, tho' Mr Bergman thinks there is no great reason to apprehend any inconvenience of this kind.

The red ore of silver may be examined by reducing Red Silver¹⁷ it to a very subtle powder, and boiling it twice gently in diluted nitrous acid. A part of the menstruum being decanted off, wash the residuum well, then precipitate the silver by means of sea-salt; boil the above-mentioned white powder quickly in aqua-regia until the arsenic be dissolved and the sulphur appear pure. The yellow solution, cautiously decanted, lets fall a very white powder on the addition of a proper quantity; and the small quantity taken up by the water may be obtained by evaporating to dryness. The sulphur separated in this manner, though it seems pure, yet contains some silver which the nitrous acid could not dissolve on account of the arsenic contained in the ore; but when this is taken away by the aqua-regia, the remaining parts of the silver adhere to the marine acid entangled among the sulphureous particles. This luna cornea may be freed from the sulphur by caustic volatile alkali diluted with water, and kept in a well-closed vessel for some days. A weight of alkaline liquor equal to that of the sulphur is sufficient. By weighing the sulphur both before and after the operation, we know the weight of it as well as the luna cornea. Iron may be discovered by means of the phlogisticated alkali.

The white ore of silver, consisting of the metal united with sulphur, arsenic, and copper, is essayed in the following manner. Let 1 cwt. of the ore, reduced to powder, be gently boiled for an hour in a little more than 12 times its weight of diluted nitrous acid. The dry powder becomes black, foul, and sends forth the smell of hepar sulphuris. Part of it is dissolved, and a white residuum remains at length at the bottom. The liquor cleared by subsiding or filtration, contains the silver and copper; the former cannot be precipitated alone by sea-salt, because the marine acid attracts the copper more strongly. A white precipitate indeed, consisting of small needle-like crystals, is thrown down; but it is found on examination

Effaying.

to consist of a peculiar combination of marine acid, silver, and copper. The silver therefore must be precipitated by a determined weight of copper, and the latter may be afterwards separated by iron or mild fixed alkali; but from the ultimate weight we must subtract that of such part of the precipitant as has entered the menstruum. The white menstruum must next be boiled in marine acid, and precipitated by water; by which means we obtain the arsenic, along with a small quantity of marine acid which it retains oblatinately. After the separation of the arsenic, it remains only to prove the purity of the sulphur by volatile alkali, in order to determine whether it still contains any luna cornea, or copper.

19
Mineralized by sulphur.

Silver mineralized by sulphur sometimes contains antimony also; and this ore often appears in the form of capillary threads of an hoary brown colour. To analyse this, let it be gently boiled, or rather digested, for an hour, in six times its weight of diluted nitrous acid, until the silver is thoroughly dissolved, and all the antimony reduced to a white calx; which, after decanting the liquor, may be separated from the sulphur by marine acid, and precipitated by water. The solution of silver may be precipitated by sea-salt, and 1 cwt. seldom contains more than four ounces. Sometimes there is present in this kind of ore a little copper and iron besides the sulphur and antimony; in which case we may conduct the experiment in the same manner, only with the addition of a double portion of acid. All the metals are easily obtained by precipitating the silver by copper, and the iron by zinc or an alkaline salt.

20
Corneous silver ore.

The corneous silver ore, in which the metal is mineralized by the marine and vitriolic acids, has two remarkable varieties; one of which may be cut, and is somewhat malleable; the other brittle, and containing some sulphur besides the acid. An hundred parts of the former, reduced to a fine powder, is to be digested for one day in marine acid, shaking the mixture from time to time. The liquor is then to be decanted clear, and the residuum, previously well washed in water, added to the liquor. A solution of terra ponderosa is to be gradually dropped into the liquor, until it ceases to occasion any precipitation. Suppose the weight of the precipitate, washed and dried, $\equiv a$; now vitriolated terra ponderosa, whose weight is a , contains of acid $0.15a$; which corresponds with vitriolated silver $0.48a$; for from 100 lb. of vitriol of silver, 68.75 of metal is obtained by reduction. But as all the silver is not precipitated from nitrous acid by mineral alkali combined with vitriolic acid, the luna cornea will therefore be $100 - 0.48a$. In the former salt, the silver contained is expressed by $0.33a$; in the latter, by $75.19 - 0.36a$; and therefore the sum required for the 100 will be $75.19 - 0.03a$. The brittle corneous ore likewise contains sulphur; but the saline part may be extracted by volatile alkali, and the quantity of metal afterwards ascertained by the method already described. Or this compound may be reduced in the following manner: Let the mass be mixed with an equal bulk of alkaline salt in a glass mortar, and be formed into a globule by means of a few drops of water: let this globule be put into a crucible, the bottom of which has been previously strewn with sal sodæ, compressed, and covered with the same

alkali. On applying a melting heat, the whole of the metal will then be reduced if the luna cornea has been properly collected.

21
Native mercury.

4. *Ores of Mercury.* Native quicksilver is seldom mixed with any other metals than gold, silver, and bismuth. The first remains at the bottom on dissolving the fluid mass in nitrous acid; the second is dissolved by sea-salt, which at the same time precipitates the mercury combined with sea-salt; and the third, though it is taken up by the spirit of nitre, is yet precipitated by the mere affusion of water.

22
Cinnabar.

The combination of quicksilver with sulphur (native cinnabar) cannot be decomposed either by vitriolic, nitrous, or marine acid. Our author has even attempted in vain to disunite them by boiling for many hours in a solution of caustic fixed alkali in water. There are, however, he tells us, two ways of effecting a perfect decomposition; one by gently boiling for an hour the cinnabar with eight times its weight of an aqua regia, one fourth of which is marine acid; the other by boiling it in marine acid, with the addition of one tenth of the weight of the cinnabar of the black calx of manganese; but the former method is preferable, as no heterogeneous matter is thus added to the mercury. The menstruum is the same in both, *viz.* the deplogiticated marine acid; the only difference is, that in the former method it is deplogiticated by the nitrous acid, and in the latter by the manganese. In whatever manner, however, the sulphur be separated, it may be collected by a filter, and the mercury precipitated by zinc: copper precipitates mercury from the marine acid in a more imperfect manner.—If the ore under examination be very much entangled in the matrice, it must be mechanically freed from it by lotions, after which the soluble parts of the matrice being taken up by the nitrous, marine, or vitriolic acid, the metal itself is separated by aqua-regia.

23
Mercury mineralized by vitriolic acid.

When mercury is mineralized by the vitriolic acid, it may be separated by the help of the marine acid by trituration or digestion, and the metal precipitated by terra ponderosa dissolved in nitrous acid; after which the weight of the new earthy salt a being given, we can easily learn the quantity of metal contained; yet, as solution of mercury in nitrous acid is not totally precipitated by Glauber's salt, we must not here depend on the weight of the precipitate. By another process, therefore, our author obtained from 100 lb. of vitriol of mercury 33.899 of pure metal, and from an equal weight of corrosive sublimate 75.5; from whence a calculation is easily deduced in the following manner. Let the quantity of vitriolic acid be $\equiv 0.15a$; the vitriol of mercury containing this, $\equiv 0.44a$; and the combination of mercury with marine acid, $\equiv 100 - 0.44a$. In the former salt the mercury constitutes $0.29a$, and in the latter $72.5 = 32a$; so that the whole metallic content in 100 lb. is $72.5 - 0.03a$. The scarcity of this ore, however, renders it still uncertain whether this combination of mercury with marine acid approaches to the nature of corrosive sublimate or mercurius dulcis. In the latter case the calculation comes out different; for mercurius dulcis contains above 0.91 of metal, and the whole content is expressed by $91.18a + 0.29a - 0.40a = 91.18 - 0.11a$.

N. B. The weights on which all these calculations

Effaying. are founded, may be found in Bergman's table of precipitates under the article CHEMISTRY.

24
Lead,

5. *Ores of Lead.* This metal, if ever found native, may be easily examined as to its purity by means of nitrous acid, which discovers copper both by its blue colour and precipitation by iron; and silver is discovered by the addition of copper.

25
Mineralized by sulphur;

When lead is mixed with sulphur, and freed from any matrix, it is to be reduced to a fine powder, and then boiled in nitrous or marine acid until the sulphur is obtained pure, which may be ascertained by the caustic fixed alkali. The solution is then to be precipitated by mild mineral alkali, when the lead is either alone or mixed with silver. In the former case, if *a* be the weight of the precipitate, that of the lead will

be $\frac{100a}{32}$. In the latter, the silver is to be extracted

by volatile alkali, and the residuum multiplied by $\frac{100a}{132}$ will give the weight of the lead. The aerated silver is known by the diminution of weight; and if this be called *b*, then the silver in a metallic state will be $\frac{100b}{129}$.

During this operation the solution in marine acid deposits a large quantity of plumbum corneum, which is to be dissolved in water before the precipitation. If antimony happens to be present, it is so much dephlogisticated by the concentrated nitrous acid, that it is calcined and falls to the bottom: the given weight of

this multiplied by $\frac{100}{138}$ shows the quantity of regulus dissolved in marine acid, which falls spontaneously upon being dropped into water, and the plumbum corneum is taken up in its place.

Iron is seldom found in galena; however, in case it should happen to exist, its presence may be discovered in the following manner. Let the solution in marine acid be first so far saturated with fixed alkali, that the acid may predominate only a little, and yet all precipitation be carefully avoided. The lead will then be precipitated by a polished plate of iron added during boiling; as will also the silver, which almost always exists in lead. The iron is then to be precipitated by aerated or phlogisticated alkali, and its weight corrected by the part of the metallic plate which is dissolved during precipitation.—When the ore contains any matrix, this is either soluble, and may at first be separated by vinegar; or else is insoluble in common acids, and is found collected at the bottom.

26
By fixed air;

When this metal is mineralized by fixed air, and deprived of all heterogeneous soluble mixtures, it may be dissolved in nitrous acid, and precipitated by aerated mineral alkali; which being done, the quantity of lead is known by the weight of the precipitate as before. But if the matrix be soluble, we must employ the marine acid, and precipitate the metal by iron, as already directed.

27
By acid of phosphorus.

Lead has lately been found mineralized by acid of phosphorus. An hundred pounds of this in powder is dissolved in nitrous acid by means of heat, excepting a few martial particles which commonly remain at the bottom. On adding the vitriolic acid, the dissolved lead falls in the form of a snow-white precipitate; which, when washed, collected, and dried, we may

suppose to weigh *a*; in which case the corresponding

lead = $\frac{100a}{143}$. The liquor remaining after precipitation yields, on being evaporated, a phosphoric acid.

6. *Ores of Copper.* This metal, when native, readily dissolves in nitrous acid. Gold, when mixed with it, falls untouched to the bottom in form of a black powder. Silver is soon precipitated by copper; and iron, by boiling the solution for some time, and inspissating to dryness, is gradually calcined and falls to the bottom.

Copper mineralized by sulphur is to be powdered, and gently boiled to dryness in five times its weight of concentrated vitriolic acid. The residuum must then be well washed with water, until all the metallic part has entered the menstruum. The quantity of water used for the solution ought to be in some degree proportioned to the goodness of the ore; that which contains 0.05 of copper requires about 0.08 of water, and so on. A polished plate of iron, about twice the weight of the copper, is then to be immersed in the solution properly diluted, and the boiling continued until all precipitation ceases. If the quantity of water be too small, the precipitated metal adheres very obliquely to the surface of the iron plate; which, however, may always be freed by making use of a proper quantity of liquid. The precipitated copper, after being well washed, is to be speedily dried; “but yet (says our author) with such a degree of heat as to make the surface of the metal of different colours, which instantly and sensibly increases the weight.”

Sometimes the precipitated copper is found mixed with iron, especially in a poor ore; in which case the iron from the precipitate must be redissolved in order to obtain a richer solution; and this deposits pure copper, if the operation has been properly conducted. A similar circumstance also takes place in the precipitation of silver by copper; a rich solution yielding the metal pure, but a poor one affording it mixed with copper. When the precipitated copper is alloyed with other metals, they may easily be separated by solution in the nitrous acid. Gold, as has already been observed, remains at the bottom in form of a black powder, and silver is precipitated on a copper plate.

During this process almost all the sulphur is dissipated by the intense heat necessary for evaporating the vitriolic acid to dryness; however, we may judge of its quantity from the sum of the weights of the other ingredients, compared with that of the whole; or a solution in aqua-regia may be made on purpose for collecting the sulphur.

The beautiful green ores of copper called *malachites*, in which the metal is mineralized by fixed air, are totally soluble in acids, and may be precipitated by iron or aerated fixed alkali. In the latter case, supposing the weight of the precipitate to be *a*, that of the copper will be $\frac{100a}{194}$.

Calcareous earth, when any happens to be present, may be thrown down by aerated alkali, and the metal precipitated by phlogisticated alkali.—Blue calciform copper, in which the metal is also mineralized by aerial acid, is to be analysed in the same way. Calciform red copper is also totally or in great part dissolved with effervescence, though somewhat weaker than the other.

Effaying.

Effaying.

³²
Red quartz
affords no
copper by
Bergman's
experi-
ments.

³⁷
Crystall-
line ores of
tin.

Mr Bergman has examined by many different ways the red quartz of Mr Cronstedt, supposed to contain a red calx of copper. None of this metal, however, was extracted either by volatile alkali, or boiling the vitriolic acid to dryness upon it. As the siliceous matrices, however, cannot easily be dissolved by the common menstrua, a quantity of mineral fluor was added to the vitriolic acid. The fluor acid has the property of dissolving the particles of quartz, and setting at liberty those of copper which might be entangled among them: but though this experiment always succeeds when copper is present, yet in this substance not the smallest sign of metal could be discovered, and therefore it is probable that Mr Cronstedt was mistaken.

by the Germans. These forms cannot be examined in the moist way without great difficulty, as they are not acted upon effectually either by vitriolic, nitrous, or marine acid, or even by aqua-regia. The reason of this insolubility is, that the calx, being well dephlogistinated, is either not taken up at all, or in very small quantity; and besides, being involved in strong particles, the menstrua can scarce have access to it. The following method is recommended by our author as one by which this process may be nearly effected.

"To a very subtile powder of the crystalline tin ore obtained not only by levigation but elutriation, let there be added a quantity of concentrated vitriolic acid, and let this be exposed to a strong digesting heat for several hours: then pour on a small portion of concentrated marine acid; and upon agitating it, a vehement effervescence immediately begins, with a considerable heat arising from the marine acid, which is partly deprived of its water by the vitriolic, and generates a marine acid air. By this method the forces of the two are conjoined: water is to be added in about an hour after, and the clear liquor decanted after the sediment has fallen. This operation is to be repeated with the residuum until the acids can dissolve no more. What remains finally undissolved is nothing more than the stony matrice. Let the solution precipitated by means of acrated alkali = a, and the quantity of regulus will be

$\frac{100a}{131}$. The subtile atoms of the crystalline ore, intimately mixed with any matrice, may, after due pulverisation, be separated by washing from a given portion, as the crystals are nearly of six times the specific gravity of water; so that they not only exceed the gravity of the earthy particles, but that of the ores of other metals, and approach even to the lighter metals themselves. The crystalline particles, after being separated, are exposed to the trial above described. The larger distinct crystals can seldom be employed; the most common ore contains particles of them very much dispersed."

The adventitious metals usually found in tin are copper and iron.

³⁸
9. Ores of Bismuth. This femimetal, when native, Bismuth, is easily taken up by nitrous acid, and may then be precipitated by water; after which any other metals that happen to be mixed with the bismuth remain in the liquor, and may be separated by the methods already frequently described. When mineralized by sulphur, the ore is decomposed by slight boiling in the same menstrum; so that the sulphur may be at last obtained; which when washed and collected is to be examined as to its purity and quantity. The solution of the metallic part precipitated by water leaves a white calx; and supposing its weight = a, that of the corresponding metal will be $\frac{100r}{113}$.

Iron is sometimes met with in these ores, which may easily be discovered after the separation of the bismuth.

Bismuth in form of a calx, whether alone or mineralized by aerial acid, is also soluble in nitrous acid, and may be precipitated by water, upon which the heterogeneous matters remain in the liquor. The presence of cobalt is discoverable by its communicating a red colour.

³⁹
Minerals.
acid

³³
Iron.

7. Ores of Iron. Though some traces of this metal are found almost every where in the mineral kingdom; yet the ores which contain it in considerable quantity, have it either mineralized by sulphur or more or less calcined. Ores of iron are frequently found in Sweden so perfect that they obey the magnet, or are themselves magnetic. These attractive and magnetic ores, though they do not contain much sulphur, are yet seldom entirely without it, though more can be extracted by menstrua. Those saturated with sulphur are called *sulphureous pyrites*, nothing but sulphur being extracted from them; for though they sometimes contain the metal in sufficient quantity to pay the expence of smelting, it is always brittle and untractable in the fire, and is easily corroded by rust on exposure to the open air.

All the ores of iron, when reduced to a very subtile powder, and repeatedly boiled in marine acid, part with their metal; the solution of the pyrites is accelerated by the addition of a small quantity of nitrous acid. In order to obtain the metal by itself, we must precipitate it by phlogistinated alkali; when, if we suppose the weight of the precipitate to be a, the corresponding quantity of metal will be $\frac{a}{6}$; but this must

be corrected according to the quantity of the precipitant. That ore which is naturally soluble by vitriolic acid requires nothing but water to precipitate by means of phlogistinated alkali.

³⁴
Manganese.

Manganese, which is frequently mixed with iron, may easily be discovered by immersing the blue sediment (carefully weighed) in water sharpened by nitrous acid; by which means the part arising from the manganese is dissolved. Other metals sometimes enter the ore of iron in larger quantities; which for the most part render the former useless, by imparting bad qualities to the melted iron.

8. Ores of Tin. The examination of native tin by the humid method is attended with no difficulty: for the addition of nitrous acid quickly deprives it so far of its phlogiston, that it is reduced to the form of a white calx; the iron and copper, if any be present, remaining in the liquor. An hundred parts of tin corroded by nitrous acid, washed and dried, yielded 140 of calx. Arsenic may be separated by washing with large quantities of warm water; for little enters the acid menstruum. The other metals are but rarely united with native tin.

³⁵
Of native tin.

The pure ore, is commonly called, according to the magnitude of its crystals, *zinngraußen* or *zwitter*,

³⁶
Its pure ore.

Effaying.

Nickel,⁴⁰

10. *Ores of Nickel.* This substance, when found native, may be dissolved by the nitrous acid; and when precipitated by aerated alkali, yields a calx which almost always contains iron, arsenic, and cobalt, in the same proportions in which they usually accompany the regulus obtained in the common way. If silver and bismuth happen to be present, which, however, is very seldom the case, the former is be precipitated by common salt before the latter is employed. Sulphur may be separated and collected during solution.

Mineralized.⁴¹

Nickel, mineralized by vitriolic acid, is scarcely ever without iron. A great part of the latter, however, is separated by long and violent boiling in water. Aerated alkali throws down a greenish white precipitate; and if we suppose the weight of this = a ,

that of the reguline nickel is = $\frac{100a}{135}$. The same metal

mineralized by aerial acid is dissolved by spirit of nitre, and may be precipitated by means of mild alkali.

Arsenic,⁴²

11. *Ores of Arsenic.* The purity of native arsenic may be examined by dissolving it in four times its weight of aqua-regia, and the solution slowly evaporated without any separation of the metal. The arsenic is then to be precipitated by water, and collected upon a filter; the heterogeneous metals will be contained in the clear liquor which passes through the filter. If any silver be present, it falls to the bottom in conjunction with the marine acid. Iron is hardly ever absent altogether, and is frequently in such quantity, that the mass has a polished appearance, most commonly crystalline, and is commonly known by the name of *mispickel*.

Mineralized by fulphur.⁴³

Arsenic mineralized by sulphur is to be dissolved in marine acid, with the addition of the nitrous occasionally, in greater or lesser quantities, so that the sulphur may be separated free from all metallic matter. The sulphur collected, washed, and weighed, indicates the quantity of the arsenical part. This, however, ought to be precipitated separately by water, and weighed; a step which is always necessary where great accuracy is required. Arsenic dissolved by marine acid may also be precipitated in its metallic form by zinc; the solution being previously weakened by spirit of wine. When sulphur alone is united to the arsenic by its different proportions, it produces different colours, from a dilute yellow to an intense red. But if a considerable portion of iron also enters the composition, a white colour is generated, and a very different species of pyrites formed, which is called the *arsenical pyrites*. This may be analyzed by solution in marine acid in the manner already described.

Too much acid of nitre must not be used.⁴⁴

In analyzing arsenical ores in general, we must take care not to add too much nitrous acid, as we would thus take away the whole of the phlogiston, and disengage the arsenical acid. The smallest quantity sufficient for solution ought therefore to be employed; otherwise water will occasion no precipitation: and even with all our caution, it is scarce possible to prevent a small portion of the arsenical acid from being disengaged, especially if the boiling be long continued. This may be recovered by evaporating to dryness, though rarely alone, but united either with the alkaline earths or the metals which are present. Some of the arsenic easily flies off.

12. *Ores of Cobalt.* This semimetal, when native,

almost always contains iron, arsenic, and frequently nickel; whence no doubt it is, that some authors have said that vitriolated cobalt is of a green colour, as well as the other salts containing this semimetal; but the truth is, that they are of an obscure red, unless the nickel be in large quantity. To separate these metals from one another, dissolve the compound mass in water, evaporate to dryness, and extract the cobalt with vinegar. Let the weight of the precipitate be a , and that of the corresponding regulus will be $\frac{100a}{160}$. If the ar-

senic be abundant in the evaporated solution, it may perhaps be precipitated by the effusion of water. Cobalt united with sulphur may be treated in the same way, as it differs from the native cobalt only in containing a small quantity of sulphur, which is to be separated and collected.

Cobalt has been discovered by Mr Brandt in a state of union with vitriolic acid, along with a large quantity of iron, and without any arsenic. This may be examined by solution in aqua regia. The solution is yellow, with scarce any redness, on account of the great quantity of iron. By boiling it assumes an obscure green, and resumes its former colour; a property by which the existence of cobalt is always known. The ore does not appear to contain any sulphur; but a few drops of solution of terra ponderosa dissolved in marine acid immediately discovered the vitriolic acid. Scarce any vestige of arsenic was to be met with. The vitriolic acid, however, though present in such abundance, was yet so far deplogificated, that it could not unite with the semimetal into a vitriolated cobalt, and therefore must be considered only as an impurity.

The trichetes of the Greeks, which is found in the mines of Hergrund and Idna, adhering to an argilla-⁴⁷ ceous stone, is found to contain a real cobalt, besides cobalt. the clay and vitriolic acid. It can only be precipitated by the phlogistated alkali.

Cobalt frequently exhibits beautiful red efflorescences, sometimes more dilute, and sometimes of a deeper colour. Sometimes it appears like a loose powder, sometimes concrete, and at times forming most beautiful crystals radiating from a centre like a star. These substances always show some vestiges of arsenic; but as this substance is incapable, either in its reguline or calcined state, of imparting a red colour to arsenic, it is reasonable to suppose that it is done by the arsenical acid itself, as all acids have the property of communicating a red colour to cobalt. To determine this point, Mr Bergman made the following experiments. 1. Having artificially combined the acid of arsenic with cobalt, he found an exact resemblance betwixt this compound and the natural crystals above mentioned. 2. On account of the scarcity of the latter substance, he extracted the pure acid of arsenic, first separating it by vitriolic acid, and then absorbing the latter by highly rectified spirit of wine, which takes up only the superfluous acid, leaving the vitriolated cobalt untouched. Natural arsenicated cobalt is scarcely soluble in water, unless the latter be sharpened by an acid; and when thus dissolved it should be precipitated by mild alkali, to discover the quantity of semimetal. Cobalt artificially combined with arsenical acid, and dried, shows the same properties with the natural.

The black calx of cobalt is generally found concreted

Effaying.

Cobalt,⁴⁵Mineralized by vitriolic acid.⁴⁶Trichetes an ore of cobalt.⁴⁷Arsenicated cobalt.⁴⁸

Effaying-
49
Blaffly ore
of cobalt.
50
Zinc.
51
Treated
by ful-
phur and
iron.

ted into an hard mafs, known by the name of the *glaffy ore of cobalt*. This, when pulverifed, may be diffolved in the marine acid or aqua-regia, and examined like the former.

13. *Ores of Zinc*. If ever this femimetal occurs in a native ftate, its purity may be eafily determined, as it is readily folfuble in all the acids; and whatever heterogeneous metal is prefent may be precipitated by zinc.

The pfeudo-galena which contains zinc mineralized by fulphur, together with iron, muft be carefully treated with nitrous acid, in order to extract the metallic part without decomposing the fulphur. If no other metal than iron be prefent, it may be precipitated by zinc; but if others alfo are combined with it, the iron muft be calcined, by repeatedly abftracting nitrous acid to drynefs, and a new folution, made by vinegar or any other acid, examined.

53
White vi-
triol ana-
lyzed.

To analyze the combination of vitriolic acid and zinc, diffolve the falt in water, and precipitate the folution with mild fixed alkali; when, if the weight of the precipitate be a , that of the regulus will be $\frac{100a}{193}$. When iron is prefent, as is ufually the cafe, it ought to be precipitated by a known weight of zinc.

53
Zinc mine-
ralized by
fixed air.

This femimetal, mineralized by aerial acid, ought to be diffolved in fome of the mineral acids, and then precipitated by phlogifticated alkali or mild fixed alkali. When the former is employed, the weight of the fedi- ment muft be divided by 5; in order to afcertain that of the metallic part.

54
Antimony,

14. *Ores of Antimony*. The purity of this femimetal, when found native, may be examined by reducing it to a calx with ftrong nitrous acid: in which cafe, if it has been entirely pure, there will remain only a fmall part diffolved in the water, and which will feparate on the addition of water. When mineralized by fulphur, the metallic part is taken up by aqua-regia, and the fulphur remains pure. The folution, by boiling with ftrong nitrous acid, lets fall a calcined antimony; which being feparated, the remaining liquor may be examined by phlogifticated alkali or otherwife at pleafure.

55
Combined
with arfe-
nic.

By the addition of a certain quantity of arfenic, crude antimony grows red, frequently exhibiting beautiful fafciculi of filaments radiating from a centre. The prefence of arfenic may be difcovered by gently boiling the powder in aqua-regia, until the fulphur be obtained pure. The arfenic and antimony are contained in the clear folution, and may be feparated in the following manner. Let concentrated nitrous acid be poured on, and the antimony reduced to a white calx by boiling. Let this be collected on a filter; and the liquor that paffes through affords arfenic by evaporation, but generally deprived of phlogifton, or reduced to the ftate of arfenical acid. As the cauftic alkali alfo takes up both fulphur and antimony, it may be advantageoufly employed, efpecially for the feparation of filver, or other metals which do not yield to this menftrum. A hepar fulphuris is indeed produced; but in this cafe it diffolves little or nothing.

56
Manganese

15. *Ores of Manganese*. This femimetal accompanies moft of the ores of iron, though it has likewife ores of its own in which it predominates, but feldom to be met with. It has never been found native or mineralized by fulphur, but commonly occurs in the form of a calx, generally alone and black, though fometimes

mineralized by the aerial acid. Thefe ores, after being reduced to a fubtile powder, muft be immerfed in any acid, particularly one of the mineral kind, together with a fmall piece of fugar, in order to fupply the phlogifton neceffary for diffolving the manganese. Fresh acid is to be poured repeatedly on the calx with fugar, until no more can be extracted by a digefting heat; after which the folution is to be precipitated by mild alkali: and if we fuppofe the weight of the fedi- ment $=a$, that of the correffponding regulus will be $\frac{100a}{180}$. The infoluble refiduum at bottom either contains heterogeneous mixtures or belongs to the ma- trice.

57
Combined
with aerial
acid.

To feparate the iron from calx of manganese com- bined with aerial acid, nitrous acid is to be repeatedly abftracted from the ore, and the heat, after each addition, increafed to ignition; after which the manganese will be obtained pure, or at leaft contaminated with iron in a much fmall degree than before. It may then be feparated by ftrong concentrated vinegar or diluted nitrous acid. Manganese, when precipitated from fuperabundant nitrous acid by phlogifticated alkali, totally diffolves in diftilled water; which properly affords likewife a method of feparating it perfectly from iron.

58
Method aff-
aying this
ver and
gold.

Befides the foregoing kind of operations which re- late only to the ores of metals, *effaying* is ufed in metal- lurgic operations to fignify the method of determining how much gold or filver is contained in any mafs of metal already melted from its ore.

1. *Effay of the Value of Silver*, to examine its purity, or the quantity of alloy mixed with it. The common method of examining the purity of filver, is by mixing it with a quantity of lead proportionable to the quantity of imperfect metals with which it is fuppofed to be alloyed; by tefting this mixture; and afterwards by weighing the remaining button of filver. The lofs of weight which the filver fuffers by cupellation fhows the quantity of imperfect metals which it contained.

We may hence perceive, that the effay of filver is nothing elfe than the refining of it by cupellation. The only difference between thefe two operations is, That when filver is tefted merely for the purpofe of refining it, its value is generally known; and it is therefore mixed with the due proportion of lead, and tefted, without any neceffity of attending to the lofs of weight it fuffers during the operation; whereas, in the effay, all poffible methods ought to be employed to afcertain precifely this lofs of weight. The firft of thefe operations, or the mere refining of filver, is made in the great, in the fmelting of filver ores, and in mints for making money *. The fecond operation is never made but in fmall; becaufe the expences of fmall operations are lefs than of great, and in the requifite accuracy is more eafily attended to. The laft operation is our prefent object, and is to be performed in the following manner.

We fuppofe, firft, that the mafs or ingot of filver of which an effay is to be made, confifts of 12 parts perfectly equal; and thefe 12 parts are called *penny-weights*. Thus, if the ingot of filver be an ounce weight, each of thefe 12 parts will be $\frac{1}{12}$ of an ounce; or if it be a mark, each of thefe will be $\frac{1}{12}$ of a mark.

Effaying-

57

58

* See Refin-
ing.

Chem. Diſſ.

Effaying.

mark, &c. Hence, if the mass of silver be free from all alloy, it is called *silver* of 12 penny-weights; if it contains $\frac{1}{2}$ of its weight of alloy, it is called *silver* of 11 penny-weights; if $\frac{2}{3}$ of its weight be alloy, it is called *silver* of 10 penny-weights; and these 10 penny-weights or parts of pure silver are called *fine penny-weights*.

We ought to observe here concerning these penny-weights, that essayers give also the name *penny-weight* to a weight equal to 24 real grains: which latter real penny-weight must not be confounded with the former, which is only ideal and proportional; and such a confusion is the more likely to take place, as this ideal penny-weight is also, like the former, divided into 24 ideal grains, which are called *fine grains*.

An ingot of fine silver, or silver of 12 penny-weights, contains then 288 fine grains; if this ingot contains $\frac{1}{11}$ part of alloy, it is said to be *silver* of 11 penny-weights and 23 grains; if it contains $\frac{2}{11}$ of alloy, it is called *silver* of 11 penny-weights and 22 grains; if it contains $\frac{3}{11}$, it is called *silver* of 11 penny-weight and 10 grains; and so on. Lastly, the fine grain has also its fractions, as $\frac{1}{2}$, $\frac{1}{3}$ of a grain, &c.

As assays to discover the value of silver are always made in small, essayers only take a small portion of an ingot for the trial; and the custom in France is to take 36 real grains for this purpose, which is consequently the largest weight they employ, and represents 12 fine penny-weights. This weight is subdivided into a sufficient number of other smaller weights, which all represent fractions of fine penny-weights and grains. Thus 8 real grains, which is half of the quantity employed, represent six fine penny-weights; three real grains represent one fine penny-weight, or 24 fine grains; a real grain and a half represent 12 fine grains; and $\frac{1}{2}$ part of a real grain represents $\frac{1}{2}$ part of a fine grain, which is only $\frac{1}{12}$ part of a mass of 12 penny-weights.

We may easily perceive, that weights so small, and essay-balances, ought to be exceedingly accurate. These balances are very small, suspended and inclosed in a box the sides of which are panes of glass, that they may be preserved from dust, and that their motion may not be affected by agitated air, so as to disorder their action *.

* See
(Essay)
Balance.

When an assay of a mass or ingot of silver is to be made, the custom is to make a double essay. For this purpose, two fictitious semi-marks, each of which may be equal to 36 real grains, are to be cut from the ingot. These two portions of silver ought to be weighed very exactly; and they ought also to have been taken from opposite sides of the ingot.

Persons accustomed to these operations know pretty nearly the value of silver merely by the look of the ingot, and still better by rubbing it on a touchstone. By the judgment they form of the purity of the ingot, they regulate the quantity of lead which is to be added to it, as this quantity must be always proportionable to the quantity of imperfect metal mixed with the silver.

Nevertheless, this proportion of lead to the alloy has not been precisely determined. Authors who treat of this subject differ much. They who direct the largest quantity of lead say, that thereby the alloy is more certainly destroyed; and others who direct a small quantity of lead, pretend, that no more of that metal

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ought to be used than is absolutely necessary, because it carries off with it always some portion of silver. Every essayer uses his own particular method of proceeding, to which he is attached.

To ascertain these doubtful points, three chemists of the Academy of Sciences at Paris, Messrs Hellot, Tillet, and Macquer, were appointed by the French government. They were directed to ascertain every thing concerning the assay of gold and silver by authenticated experiments, made under the inspection of a minister whose superior knowledge is equal to his desire of public good, and in presence of the officers of the mint.

The experiments made by these chemists, and the consequent regulation, have determined that four parts of lead are requisite for one part of silver of 11 penny-weight and 12 grains, that six parts of lead are requisite for silver of 11 penny-weight, eight parts of lead for silver of 10 penny-weight, 10 parts of lead for silver of nine penny-weight, and so on in the same progression.

Two cupels of equal size and weight are to be chosen. The custom is to use cupels of such a size that their weight shall be equal to that of one half of the lead employed in the assay; because such cupels have been found capable of imbibing all the litharge formed during the operation. These cupels are to be placed together under a muffle in an assay-furnace. The fire is to be kindled, and the cupels are to be made red-hot, and to be kept so during half an hour at least before any metal be put into them. This precaution is necessary to dry and calcine them perfectly; because if they contained any moisture or inflammable matter, an ebullition and effervescence would be occasioned in the essay. When the cupels are heated so as to become almost white, the lead is to be put into them; the fire is to be increased, which is done by opening the door of the ash-hole so as to admit air, till the lead becomes red, smoking, and is agitated by a motion of its parts called its *circulation*, and till its surface becomes smooth and clear.

Then the silver, previously beat into small plates for its easier fusion, is to be put into the cupels; the fire is to be continued, and even increased, by putting hot coals at the mouth of the muffle, till the silver shall have entered the lead, that is, till it have melted and mixed with the lead. When the melted matter circulates well, the heat is to be diminished by taking away, partly or entirely, the coals put at the mouth of the muffle, and by closing more or less the doors of the furnace.

The heat ought to be regulated so, that the essays in the cupels shall have surfaces sensibly convex, and shall appear ardent, while the cupels are less red; that the smoke shall rise almost to the roof of the muffle; that undulations shall be made in all directions upon the surfaces of the essays, which are called *circulations*; that their middles shall be smooth, and surrounded with a small circle of litharge, which is continually imbibed by the cupels.

The essays are to be kept in this state till the operation is finished, that is, till the lead and alloy have soaked into the cupel; and the surfaces of the buttons of silver being no longer covered with a pellicle of litharge, become suddenly bright and shining, and are then

then said to *lignite*. If the operation has been well conducted, the two essays ought to become bright nearly at the same time. When the silver has been by this operation well refined, we may see, immediately after it has brightened, the surface of the silver covered with rainbow colours, which quickly undulate and cross each other, and then the buttons become fixed or solid.

The management of the fire is an important article in essays. For if the heat be too great, the lead is scorified and imbibed by the cupel so quickly, that it has not sufficient time to scorify and carry along with it all the alloy; and if the heat be too little, the litharge is gathered upon the surface, and does not penetrate the cupel. The essayers say then, that the essay is *choaked* or *drowned*. In this case the essay does not advance; because the litharge covering the surface of the metal defends it from the contact of air, which is absolutely necessary for the calcination of metals.

We have above related the marks of a successful essay. The heat may be known to be too great, from the convexity of the surface of the melted metal; from a too strong circulation; from the too vivid appearance of the cupel, so that the colours given to it by the litharge cannot be distinguished; and, lastly, by the smoke rising up to the roof of the muffle, or not being at all visible from its being so ardent and red-hot as not to be distinguishable. In this case, the heat must be diminished by shutting the door of the ash-hole: Some essayers, for this purpose, put round the cupels small, oblong, cold pieces of baked clay, which they call *instruments*.

If, on the contrary, the melted metal have a surface not very spherical, relatively to its extent; if the cupel appear dark-coloured, and the smoke of the essay do only creep upon the surface; if the circulation be too weak, and the scoria, which appears like bright drops, have but a dull motion, and be not soaked into the cupel; we may be assured that the heat is too weak; much more may we be assured of it when the metal *fixes*, as the essayers call it. In this case, the fire ought to be increased by opening the door of the ash-hole, and by placing large burning coals at the mouth of the muffle, or even by laying them across upon the cupels.

As soon as the lead is put into the cupels, the fire is to be increased, because they are then cooled by the cold metal; and the lead ought to be quickly melted, to prevent its calx from collecting upon its surface in too great quantity before it be formed into litharge; which it would do, and be difficultly fused, if the heat were too weak.

When the silver is added to the lead, the heat must be still increased; not only because the silver cools the mass, but because it is less fusible than lead. And as all these effects ought to be produced as quickly as possible, more heat is at length given than ought to be continued; and therefore, when the silver has entered the lead, the heat is to be diminished till it becomes of a due intensity for the operation.

During the operation, the heat ought gradually to be augmented to the end of it, both because the metallic mixture becomes less fusible as the quantity of lead diminishes; and also because the lead is more difficultly scorifiable, as it is united with a larger proportion of silver. Hence the essays must be rendered very hot before they brighten.

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When the operation is finished, the cupels are left in the same heat during some seconds, to give time to the last portions of litharge to be entirely absorbed; because, if any of it remained under the buttons of silver, it would stick to them. The fire is then allowed to extinguish, and the cupels to cool gradually, till the buttons have entirely fixed, particularly if they be pretty large; because if they cool too quickly, their surfaces fix and contract before the internal mass, which is thereby so strongly compressed as to burst through the external solid coat and form vegetations, or even to be entirely detached from the rest of the mass, and dissipated. This is called the *vegetation of the buttons*. It ought to be carefully prevented, because small bits of silver are sometimes thrown out of the cupel.

Lastly, when the buttons are thoroughly fixed, they are to be disengaged from the cupels by a small iron utensil while they are yet hot; otherwise they could not be disengaged clean and free from part of the cupels, which strongly adhere to them when the heat is much diminished.

Nothing then remains to complete the essay, but to weigh the buttons. The diminution of weight which they have sustained by cupellation will show the purity or value of the ingot of silver.

We ought to observe, that as almost all lead naturally contains silver, and that after cupellation this silver is mixed with the silver of the ingot in the button of the essay; before we employ any lead in this operation, we ought to know how much silver it contains, that we may subtract this quantity from the weight of the button, when we compute the fineness of the silver of the ingot essayed. For this purpose essayers generally cupel a certain quantity of their lead separately, and weigh accurately the button of silver it yields: or, at the same time when they essay silver, they put into a third cupel, in the muffle, a quantity of lead equal to that employed in both their essays; and when the operation is finished, and the buttons are to be weighed, they throw the small button produced from the lead alone into the scale which contains the weights; and as this exactly counterpoises the small portion of silver which the essay buttons have received from the lead employed in the cupellation, the weights will show precisely the quantity of silver contained in the ingot, and thus the trouble of calculating is prevented. The small button of silver procured from the cupellation of lead alone is called the *winse*. But to prevent this trouble, essayers generally employ lead which contains no silver, such as that from Willach in Carinthia, which is therefore procured by essayers.

In the second place, we shall observe, that a certain quantity of silver always passes into the cupel, as refiners in the great have long observed, and which happens also in essaying small quantities. The quantity of silver thus absorbed, varies according to the quantity of the lead employed, and the matter and form of the cupels; all which objects will undoubtedly be determined by the above mentioned chemists.

The cupellation which we have now described is exactly the same for essays by which the produce of a silver ore, or of an ore of another metal containing silver, is determined. But as these ores contain frequently gold, and sometimes in considerable quantity, when these essays are made, the buttons of silver obtained

by the essays ought to be subjected to the operation called *paring*. See SILVER, REFINING, &c.

M. Tillet has published a memoir, showing that essays of silver made in the common method are uncertain and not to be depended upon; and that this uncertainty proceeds from the different quantities of silver absorbed by the cupel in different essays, according as the heat and other circumstances happened to vary. He therefore proposes, in order to render essays accurate, to extract from the cupel the quantity of silver it has absorbed during the operation, and to add this particle of silver to the button, as these two contain the whole quantity of silver in the matter essayed.

The variations in the different results of different essays, or of the same essayer at different times, upon the same mass of silver, are sufficient proofs of the uncertainty mentioned by M. Tillet. These variations are occasioned, according to that author, principally from the following causes: 1. From the inaccuracy of the balances and weights employed. 2. From the faulty fusion of the mass to be essayed; by which means the contained alloy may be unequally diffused. 3. From the impurity of the lead, especially from its containing silver, which is not always equally diffused through its mass. 4. From the different proportions of lead used by different essayers. 5. From the difference of the intensity of heat: for if the heat be not sufficiently intense, the silver will still contain a portion of alloy; and if the heat be too intense, too much of the silver will be imbibed by the cupel. 6. From the want of care in picking the small particles of silver, which frequently adhere to the sides of the cupel separately, from the principal button. 7. From the spurring which sometimes happens unobserved by the essayer; and which may further falsify the essays of other pieces included under the same muffle, by the falling of the particles thrown out of one cupel into others adjacent. But, with all the attentions to avoid these causes of error, the author obtained different results from different essays of the same mass of silver. Nor could he, by any method, make his different essays consistent with each other, but by adding to each button the particle extracted from the cupel; and this method he found by accurate experiments to be perfectly exact.

M. Tillet observed, that the quantity of lead directed in the regulations established in consequence of the report made by Messrs Macquer, Hellot, and Tillet, is not sufficient to purify the silver perfectly from its alloy. He nevertheless approves of the said regulation; and considers the weight of the alloy retained by the button, as some compensation for the weight of the silver absorbed by the cupel. And as it is a constant fact, that the more lead is used, the greater is the loss by the absorption of the cupel, he remarks, that a regulation, directing a larger proportion of lead for France than is used in other countries, would be disadvantageous to that kingdom; as thereby the silver of the same denomination would be required to be finer in that than in other countries where a less proportion of lead was employed. He observes, that the above mentioned rule, "that the more lead is used, the greater is the loss by the absorption of the cupel," does not extend to quantities of lead much above double the usual quantities. Thus 32 parts of lead to one of silver, will not occasion more absorption than 16 parts of

lead. For the refining scarcely takes place till the extraordinary quantity of lead be gone, and the silver is only or chiefly carried into the cupel along with the copper. Accordingly, he found, that he could render the silver finer by using four parts of lead at first, and afterwards adding two more parts when the trials began to appear, than by employing all the six parts of the lead at once. By this method of dividing the quantity of lead, the loss of silver by absorption was greater. M. Tillet did not find, that, by employing bismuth alone, or mixed with lead, his essays were more certain than when lead alone was used. He observed, however, that the addition of bismuth made the silver purer, but occasioned a greater absorption by the cupel.

2. *Essay of the Value of Gold.* The fictitious weights used to determine the purity of gold, and to essay this metal, are different from those of silver. See the preceding article. A mass of gold perfectly pure, or which contains no alloy, is ideally divided into 24 parts, called *carats*; this pure gold is therefore called *gold of 24 carats*. If the mass or ingot contains $\frac{1}{24}$ th part of its weight of alloy, the gold is then of 23 carats; and if it contains $\frac{2}{24}$ th or $\frac{1}{12}$ th of alloy, it is gold of 22 carats, &c. Hence we see, that the carat of gold is only a relative and proportional weight, so that the real weight of the carat varies according to the total weight of the mass of gold to be examined. If this mass of gold weighs a mark, the real weight of the carat will be $\frac{1}{24}$ th of eight ounces, which is equal to a mark. If the mass weigh an ounce, the carat will be $\frac{1}{24}$ th part of an ounce, or 24 grains. If it is only a penny-weight or 24 grains, the real weight of a carat will be one grain; and so on.

For greater accuracy, the carat of gold is divided into 32 parts, which are relative and proportional weights, as the carat itself is. Thus $\frac{1}{32}$ d of a carat of gold is $\frac{1}{32}$ d of $\frac{1}{24}$ th, or the $\frac{1}{768}$ th of any mass of gold: and the gold which contains an alloy equal to the $\frac{1}{768}$ th part of the whole mass is called *gold of 23 carats*, and $\frac{1}{32}$; gold which contains $\frac{2}{768}$ th of alloy is *gold of 23 carats* and $\frac{1}{32}$; and so on.

The real weight now generally used in the operation for determining the purity of gold is six grains. This weight then represents 24 carats. The half of this weight, or three real grains, represents 12 carats. According to this progression, we shall find that $\frac{1}{4}$ th of a real grain represents one carat, and the $\frac{1}{16}$ th part of a grain represents the $\frac{1}{32}$ d of a carat, or the $\frac{1}{768}$ th part of a mass of gold to be essayed.

As these weights are exceedingly small, some essayers employ a weight of 12 grains, which must be very convenient.

When a mass or ingot of gold is to be essayed, six grains are to be cut off, and exactly weighed: also 18 grains of fine silver are to be weighed. These two metals are to be cupelled together with about ten times as much lead as the weight of the gold. This cupellation is conducted precisely like that of the essay to determine the purity of the silver, excepting that the heat must be raised a little more towards the end of the operation when the essay is going to brighten. Then the gold is freed from all alloy but silver. If the quantity of copper or other alloy destructible by cupellation be required to be known, the remaining button is accurately weighed. The diminution of weight from the

may hatchum of the weights of the gold and of the silver determine the quantity of this alloy.

The button containing gold and silver is then to be flattened upon a polished piece of steel, and care must be taken to anneal it from time to time, to prevent its splitting and cracking. By this method it is reduced to a thin plate, which is to be rolled up, in order to be parted by aquafortis*. The diminution found after the parting from the original weight of the gold effayed, shows the whole quantity of alloy contained in that gold.

The essay for determining the purity of gold is then made by two operations: the first, which is cupellation, deprives it of all its imperfect metals; and the second, which is parting, separates all the silver from it. By antimony also gold may be purified, which is a kind of dry parting. By this single operation, all the imperfect metals, and silver with which gold is alloyed, are separated. See PURIFICATION, GOLD, SILVER, REFINING.

Essay-Hatch, is the miners term for a little trench or hole, which they dig to search for flint or ore.

ESSEDARI, a sort of gladiators, mentioned by Seneca, Suetonius, and Tully, who on some occasions engaged one another out of chariots called *essedae*. The *essedum* was a sort of heavy chariot from which the Gauls and Britons engaged the Romans. See GLADIATOR.

ESSENCE, in metaphysics, that which constitutes the particular nature of each genus or kind, and distinguishes it from all others: being nothing but that abstract idea to which this name is affixed, so that every thing contained in it is essential to that particular kind.

This Mr Locke calls the *nominal essence*; in contradistinction to the real essence, or constitution of substances on which this nominal essence depends. Thus the nominal essence of gold is that complex idea the word *gold* stands for; let it be, for instance, a body, yellow, weighty, malleable, fusible, and fixed: but its real essence is the constitution of its insensible parts, on which these qualities and all its other properties depend, which is wholly unknown to us.

ESSENESE, or ESSENIANS, in Jewish antiquity, one of the three ancient sects among that people. They allowed a future state, but denied a resurrection from the dead. Their way of life was very singular: they did not marry; but adopted the children of others, whom they bred up in the institutions of their sect: they despised riches, and had all things in common, and never changed their cloaths till they were entirely worn out. When initiated, they were strictly bound not to communicate the mysteries of their sect to others; and if any of their members were found guilty of enormous crimes, they were expelled.

Pliny tells us, that they dwelt on the west side of the lake of Asphaltites; and that they were a solitary kind of men, living without women or money, and feeding upon the fruit of the palm-tree: he adds, that they were constantly recruited by new comers, whom the furies of ill fortune had made weary of the world; in which manner the sect was kept up for several thousands of years, without any being born among them. The reason why we find no mention made of them in the New Testament, may be their recluse and retired way of life, not less than their great simplicity

and honesty, whereby they lay open to no censure or reproach.

ESSENTIAL, something necessarily belonging to a thing, from which it cannot be conceived distinct: thus the primary qualities of bodies, as extension, figure, number, &c. are essential or inseparable from them in all their changes and alterations.

ESSENTIAL Oils are such as are really contained in a plant, and are drawn from it by distillation in an alembic with water: they are thus called, in contradistinction to empyreumatic oils, which are raised by a naked fire without water.

ESSEX, a county of England, bounded on the north by the Stour, which separates it from Suffolk and Cambridgeshire; on the east, by the German sea; on the west, by Hertfordshire and Middlesex; and on the south by the river Thames. It extends 45 miles in length from E. to W. and about 42 in breadth from N. to S. and 200 in circuit. This county is in the diocese of London, and gives title of Earl to the family of Capel. It is divided into 19 hundreds, and contains 27 market-towns, 415 parishes, 125 vicarages, and 1100 villages, with about 34,800 houses, and 208,800 inhabitants. It sends eight members to parliament; namely, two for the county, and two for Colchester, Harwich, and Malden. The air in the island parts is healthy; but in the marshes near the sea it produces agues, particularly in the part called the Hundreds. However, the fertility of the unwholesome part is very great, and even the higher grounds of this county are very fruitful. About Saffron Walden, the earth, after bearing saffron three years, it is said, will produce good barley for 18 years successively without any manure. Its produce, which is very plentiful, consists of corn, most excellent saffron, cattle, fowl, fish, and particularly oysters. The chief manufactures of this county are cloth, stuffs, and particularly baize. The principal rivers, besides the Thames, are the Stour, which falls into the German sea at Harwich; the Lea, its western boundary, falls into the Thames below Stratford; the Blackwater runs thro' the heart of the county, and passing by Chelmsford is joined by the Chalmers, and from thence runs into the German sea; the Coln runs by Halled to Colchester, and so into the sea. The Roding which rises northwards, near Dunmow, runs into the Thames near Barking. All these rivers abound in most sorts of fish.

ESTATE, in law, signifies the title or interest that a person has in lands, tenements, or other effects; comprehending the whole in which a person hath any property, and will pass the same.

Estates are either real or personal; otherwise distinguished into FREEHOLDS, which descend to heirs; or CHATTELS, that go to executors or administrators.

A fee-simple is the amplest estate our law admits of. See FEE.

Estates are obtained several ways; as, by descent from a father to a son; by conveyance or grant from one person to another; by gift or purchase; or by deed or will. See DESCENT, SUCCESSION, TENURE, &c.

ESTATES, in a political sense, is used either to denote the dominions of some prince, or the general classes into which the people are divided.

In Britain, the estates are the king, lords, and commons;

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mons; or rather the lords and commons, who meet the king in parliament, for reforming abuses, and enacting good and wholesome laws.

ESTHER, a canonical book of the Old Testament; containing the history of a Jewish virgin, dwelling with her uncle Mordecai at Shushan, in the reign of Ahasuerus, one of the kings of Persia.

The great beauty of this maid raised her to the throne of Persia; whereby she had an opportunity to save her countrymen, whose destruction was plotted by Haman, a favourite of that prince.

The learned are not agreed who this Ahasuerus was. Archbishop Usher supposes him to be Darius Hystaspes, and Artystona to be Esther. Scaliger makes him the same with Xerxes, and his queen Hanestris to be Esther. Josephus, on the contrary, positively asserts, that the Ahasuerus of the scriptures, is the Artaxerxes Longimanus of profane story; and the Septuagint, throughout the whole book of Esther, translate Ahasuerus by Artaxerxes. Most people subscribe to this last opinion; and indeed the extraordinary kindness showed by Artaxerxes to the Jews, can scarce be accounted for otherwise than by supposing that they had so powerful an advocate as Esther to solicit for them.

ESTOILEE, or CROSS ESTOILEE, in heraldry, a star with only four long rays in form of a cross; and, accordingly, broad in the centre, and terminating in sharp points.

ESTONIA, is a province of the Russian empire, and part of Livonia. It is bounded on the east by the Baltic sea, on the north by the Gulph of Finland, on the west by Ingria, and on the south by Lettonia. It is divided into six districts: 1. Harrien; 2. Wireland; 3. Alentakin; 4. Wich; 5. Jerven; and 6. Odepoa. The principal towns are, Revel, Weissenberg, Berchholm, Narva, Nyllot, Habsal, Derpt, St Elin, Pernau, and Roderfwick.

In former times the inhabitants of this country carried on a good trade in corn, which was dried in faves: but wars have much depopulated the country, inasmuch that not a fourth part of it is inhabited, and a great number of gentlemen's seats lie in ruins.

ESTOPPEL (formed of the French *stopper, opposare, opposare*, "to stop, or block up"), in law, an impediment or bar of action, arising from a man's own act or deed; against which a man is forbidden, by law, to speak, though it be to say the truth.

ESTOVERS, in law, is used, by Bracton, for that sustenance which a man, committed for felony, is to have out of his lands or goods for himself and his family during imprisonment. In stat. 6 Edw. I. it is used for an allowance in meat or clothes. In some manors, the tenants have *common of Estovers*; that is, necessary botes or allowances out of the lord's wood: in which last sense, estovers comprehends house-bote, hay-bote, and plow-bote; so that if a man have in his grant these general words, *de rationabilibus estoverio in bosibus*, &c. he may thereby claim all three.

Estovers is also used for alimony, which, if the husband refuses to pay, there is, besides the ordinary process of excommunication, a writ at common law, *de estoveriis habendis*, in order to recover it.

ESTRAY, or STRAY, signifies any tame beast, as sheep, oxen, swine, and horses, or swans, found within a lordship, and not owned by any man; in which

case being cried, according to law, in the church, and two market towns adjoining, if it be not claimed by the owner within a year and a day, it becomes the lord's of the soil where found. If the owner claims it within the year and day, he must pay the charges of finding, keeping, and proclaiming them; and he may seize it, without telling the marks or proving his property, which may be done at the trial if contested. If the beast stray within the year to another lordship, the first lord cannot retake it. An estray must be fed and kept, uninjured, and without labour, till it is reclaimed or the limited time expires.

ESTREAT, *EXTRACTUM*, in law, is used for the true copy or duplicate of some original writing, especially of amercements or penalties set down in the rolls of a court, to be levied by the bailiff or other officer, on every offender.

ESTREMADURA, a province of Spain, has New Castile on the east, Leon on the north, Andalusia on the south, and Portugal on the west. It is 175 miles in length, and 100 in breadth; and its principal towns are, Calatrava, Menda, and Badajoz, on the river Guadiana; Alcantara, on the Tajo; and Cona and Placentia, to the north of this river.

This province enjoys a very pure and healthful air, and its mountains are full of wild and tame animals; they having woods and forests for the one sort, and pastures for the other. The fields are planted with fruit-trees, which bear all kinds of delicious fruit. The vineyards produce excellent wines of all colours, and the fields yield plenty of corn.

ESTREMADURA, a province of Portugal, near the mouth of the Tagus or Tajo, bounded on the north by Beira, on the east and south by Alentejo, and on the west by the Atlantic Ocean. It is about 88 miles in length, and 45 in breadth. This province is divided into six comarcas, viz. Litria, Lisbon, Tomar, Santaren, and Alenquer, to the north of the Tagus; and that of Setubal, to the south of this river. These are likewise the principal towns. Estremadura is equal, if not preferable, to any other province in Spain or Portugal. The district of Santaren produces such plenty of corn, and feeds so many flocks of sheep, that it may enter into competition with Sicily. The fruits and the wines are all excellent; and it was here that the sweet oranges brought from China were first planted, and of which there are large quantities transported to foreign parts, with the wines and other fruits. The fields are covered with flowers almost all the year, from which the bees collect large quantities of fine honey. The olive-trees are numerous, from which they have excellent oil. The rivers abound with good fish, and the mountains have quarries of several kinds.

ETCHING, a method of engraving on copper, in which the lines or strokes, instead of being cut with a tool or graver, are eaten in with aquafortis. See ENGRAVING.

Etching is of a later invention, though not very modern, than engraving with the tool; of which it was at first only an imitation, that was practised by painters and other artists, who could much sooner form their hands to, and attain a faculty of, working in this way, than with the graver. But being then nevertheless considered as a counterfeit kind of engraving, and therefore inferior to the other, it was cultivated

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Etching. vated in a very confined manner; the closeness of the resemblance of the work to that performed by the tool, being made the test of its merit, and consequently the principal object of aim in those who pursued it. This servile confinement of the art of etching to the imitation of the original kind of engraving, was a great cause of retarding its advancement towards perfection, as many of the most able masters cramped their talents with the observance of it: which may be seen in the instances of Sadlers, Swaneberg, Villamena, and particularly Le Bossé; who, in his treatise on engraving, has laid down as a principle, that the perfection of this kind consists in the close similitude of the work with that done by the tool. This absurd prepossession has been since worn out: and the method of working with aquafortis has been so far improved, that instead of being now deemed a spurious kind of engraving, it evidently appears the foundation of an excellence in many modern works, that could never have been produced without it: since, though the neatness and uniformity of the hatches, which attend the use of the tool, is more advantageous with respect to portraits; yet the liberty and facility of the other manner give a much greater opportunity to exercise the force of genius and fancy in history-engraving; where the effect of the whole, and not the minute exactness in finishing all the parts, constitutes the principal value.

There are two methods practised of engraving in this way; the one with a hard varnish or ground, the other with a soft. The first was formerly much used, being better accommodated to the intention of imitating the engraving with the tool; as the firmness of the body of the varnish gave more opportunity of retouching the lines, or enlarging them with the oval-pointed needles, called by the French *échoppes*, as was practised by Le Bossé and others for that purpose. The latter has now almost wholly superseded the use of the other, by the free manner of working it admits of; which affords a power of expression incompatible with the greater inflexibility of the hard varnish, that confines the lines and hatches to such a regularity and sameness, as gives a stiffness of manner and coldness of effect to the work.

The mixture of the use of the tool and aquafortis, which are now both employed in many cases, has, however, given that perfection to engraving which it possesses at present. The truth and spirit of the outline that the method of working with aquafortis affords, and the variety of shades which the different kinds of black produce in this way, as well as other means of expressing the peculiar appearance and character of particular subjects, furnish what was defective in the sole use of the tool; while, on the other hand, the exactness and regularity of the lines, which are required for finishing many kinds of designs, are supplied by the graver; and by a judicious application of both, that complete finishing is obtained, which either of them alone must necessarily want.

The manner by which this art is performed, is the covering the surface of the plate with a proper varnish or ground, as it is called, which is capable of resisting aquafortis; and then scoring or scratching away, by instruments resembling needles, the parts of this varnish or ground, in the places where the strokes or hatches of the engraving are intended to be: then, the plate being covered with aquafortis, the parts

Etching. that are laid naked and exposed by removing the ground or varnish, are corroded or eaten away by it; while the rest, being secured and defended, remain untouched.

There are two methods of etching, as hath been already observed; the difference of which from each other consists, as well in the difference of the varnish or ground, as in that of the aquafortis, adapted to each kind; but the general methods of performing them are alike in both. These varnishes or grounds are distinguished by the names of *hard* and *soft*: for in their consistence, or the resistance they give to the needles, lies their essential variation from each other. The hard varnish, it is with good reason conjectured, was not the first in use: but soon took place of the other; and was, for some time, the most received in practice, on account of its admitting the work to be made more like that of the graver: the soft has, however, since, in its turn, prevailed to the exclusion of it in some degree, except in the case of particular subjects; but not so entirely as to take away the expedience of showing how it is performed. The manner of etching with the soft varnish is now, however, one of the most important objects of the art of engraving; and it is at present in universal use, sometimes alone, but more frequently intermixed with the work of the tool, and in some cases with great advantage, even where the whole is intended to pass for being performed by the graver.

Preparation of the soft varnish; according to Mr Lawrence, an eminent English engraver at Paris. "Take of virgin wax and asphaltum, each two ounces; of black pitch and Burgundy pitch, each half an ounce. Melt the wax and pitch in a new earthen-ware glazed pot; and add to them, by degrees, the asphaltum finely powdered. Let the whole boil till such time as that, taking a drop upon a plate, it will break when it is cold, on bending it double two or three times betwixt the fingers. The varnish being then enough boiled, must be taken off the fire; and letting it cool a little, must be poured into warm water, that it may work the more easily with the hands, so as to be formed into balls; which must be rolled up, and put into a piece of taffety for use."

It must be observed, first, that the fire be not too violent, for fear of burning the ingredients; a slight simmering will be sufficient: secondly, that while the asphaltum is putting in, and even after it is mixed with them, the ingredients should be stirred continually with the spatula: and thirdly, that the water, into which this composition is thrown, should be nearly of the same degree of warmth with it, to prevent a kind of cracking that happens when the water is too cold.

The varnish ought always to be harder in summer than in winter; and it will become so if it be suffered to boil longer, or if a greater proportion of the asphaltum or brown resin be used. The experiment above-mentioned, of the drop suffered to cool, will determine the degree of hardness or softness that may be suitable to the season when it is used.

Preparation of the hard varnish used by Callot, commonly called the Florence varnish. Take four ounces of fat oil very clear, and made of good linseed oil, like that used by painters: heat it in a clean pot of glazed earthen

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easthen-ware, and afterwards put to it four ounces of mallick well powdered; and stir the mixture briskly till the whole be well melted; then pass the whole mafs through a piece of fine linen into a glass bottle with a long neck, that can be stopp'd very securely; and keep it for the use that will be below explained.

Method of applying the soft varnish to the plate, and of blackening it. The plate being well polished and burnished, as also cleansed from all greasiness by chalk or Spanish white, fix a hand-vice on the edge of the plate where no work is intended to be, to serve as a handle for managing it when warm: then put it upon a chafing-dish, in which there is a moderate fire; observing to hold it so that it may not burn: keep the plate over the fire till it be fo hot that the varnish being brought into contact with it may melt: then cover the whole plate equally with a thin coat of the varnish; and while the plate is warm, and the varnish upon it in a fluid state, beat every part of the varnish gently with a small ball or dauber made of cotton tied up in taffety; which operation smoothes and distributes the varnish equally over the plate.

When the plate is thus uniformly and thinly covered with the varnish, it must be blackened by a piece of flambeau, or of a large candle which affords a copious smoke; sometimes two, or even four, such candles are used together for the sake of dispatch, that the varnish may not grow cold: which if it does during the operation, the plate must then be heated again, that it may be in a melted state when that operation is performed: but great care must be taken not to burn it; which, when it happens, may be easily perceived by the varnish appearing burnt and losing its gloss. The following expedient is made use of for the more commodiously blackening the varnish, being particularly necessary where the plates are large: Fix a strong hook in the roof of the room, through which pass four pieces of cord of equal length, at the end of which are fixed four iron rings of about four inches diameter, for supporting the corners of the plate. The plate being thus suspended in the air, with the varnished side downwards, may be blackened with great convenience: but this is not, however, absolutely requisite, except in the case of large plates that could not, without difficulty, be held up, unless this or some other such contrivance were made use of.

It is proper to be very cautious in keeping the flambeau or candle at a due distance from the plate, lest the wick touch the varnish, which would both sully and mark it. If it appear that the smoke has not penetrated the varnish, the plate must be again placed for some little time over the chafing-dish; and it will be found, that, in proportion as the plate grows hot, the varnish will melt and incorporate with the black which lay above it, in such a manner that the whole will be equally pervaded by it.

Above all things, the greatest caution should be used in this operation, to keep all the time a moderate fire; and to move frequently the plate, and change the place of all the parts of it, that the varnish may be alike melted every where, and kept from burning. Care must also be taken, that during this time, and even till the varnish be entirely cold, no filth, sparks, or dust, fly on it; for they would then stick fast, and spoil the work.

Method of applying the hard varnish. This is precisely

Etching.

the same as for the soft; being spread equally over the warm plate with the taffety-ball, and smoked in the same manner: only after it is smoked, it must be baked, or dried over a gentle fire of charcoal, till the smoke from the varnish begins to decrease; taking care not to overheat the plate, which would both soften it and burn the varnish.

The plate being thus prepared, and an exact drawing of the outlines of the design made upon thin paper, the other side of the paper must be well rubbed with chalk or Spanish whitening, or, which is better, with red chalk scraped to a powder; and the loose chalk is cleared off with a linen rag: then the stained side of the paper is laid upon the varnish, fixing the corners to the plate with wax or wafers, to prevent its shuffling; and with a blunted needle or pointer the drawing is slightly traced, and communicates to the varnish an exact outline of the design to be etched.

A variety of pointers is necessary for the work. Those used for the broad large strokes ought to be very blunt, exceeding round, and well polished at the point; the foal of a shoe answers very well for polishing the points. The finest ought to be as sharp as a needle. If any scratches or false strokes happen in the working, they are to be stopp'd up with a hair-pencil dipped in Venetian varnish, mixed with lamp-black, by which means these places will be defended from the action of the aquafortis.

The next operation is that of eating or corroding the plate with aquafortis; in order to which, a border of soft wax (being a composition of bees-wax melted and tempered with a little Venice turpentine and talow) must be fastened round the plate about an inch high, in the form of a little wall or rampart, to contain the aquafortis. At one of the corners of this border a gutter is usually made, which serves for pouring commodiously the aquafortis off the plate. The plate being thus bordered, take a due quantity of the refiners aquafortis; mix it with half its quantity of common water; and pour it gently on, till it rise above a finger's breadth above the surface of the plate; when, if all things have been rightly conducted, it will be seen that the aquafortis will soon exert its action in the hatches which have been strongly touched; but those more weakly engraved will appear at first clear, and of the colour of the copper. The menstruum must therefore

be suffered to continue on the plate till its effects become visible on the more tender parts: then the aquafortis should be poured off, the plate washed with clean water, and dried before the fire: then take a small pencil dipped into the Venetian varnish, and cover with it the lighter parts of the plate. This being done, the aquafortis must again be poured on, and suffered to continue a longer or shorter time, according to the strength of the menstruum, or the nature of the engraving; when it must be again poured off as before, and the plate immediately washed with water.

It may not be improper to observe, that, when the aquafortis is on the plate, a feather should be used to cleanse away the foulness of the verdigris that gathers in the hatches when the aquafortis operates on them, and to give it more room to exert its action; for by moving the aquafortis to and fro on the plate by the feather, and brushing away the black saline matter where it appears to be formed, the hatches will be cleansed,

Eteocles || **Etefian.** cleansed, and the aquafortis exert its whole force equally on every part.

The plate being thus sufficiently corroded by the aquafortis, and well washed with water, it must be warmed at the fire, and the border of wax removed; after which, it must be made hotter till the varnish melt; then it must be well wiped with a linen cloth, and afterwards rubbed heartily with oil of olives; when it will be ready to be retouched and finished by the graver. See the article ENGRAVING.

ETEOCLES (fab. hist.), a son of Œdipus and Jocasta. After his father's death, it was agreed between him and his brother Polynices, that they should both share the royalty, and reign alternately each a year. Eteocles by right of seniority first ascended the throne; but after the first year of his reign was expired he refused to give up the crown to his brother, according to their mutual agreement. Polynices, resolved to punish such an open violation of a solemn engagement, went to implore the assistance of Adrastus king of Argos. He received that king's daughter in marriage, and was soon after assisted with a strong army headed by seven famous generals. These hostile preparations were seen by Eteocles, who on his part did not remain inactive. He chose seven brave chiefs to oppose the seven leaders of the Argives, and stationed them at the seven gates of the city. He placed himself against his brother Polynices, and he opposed Menalippus to Tydeus, Polyphontes to Capaneus, Megareus to Eteocles, Hyperbius to Parthenopæus, and Læthesus to Amphiraus. Much blood was shed in light and unavailing skirmishes, and it was at last agreed between the two brothers that the war should be decided by single combat. They both fell in an engagement conducted with the most inveterate fury on either side; and it is even said that the ashes of these two brothers, who had been so inimical one to the other, separated themselves on the burning pile, as if sensible of repentment, and hostile to reconciliation.

ETERNITY, an attribute of God, expressing his infinite or endless duration. See **LOGIC** and **METAPHYSICS**.

ETERNITY, in mythology, a divinity among the Romans, who had neither temples nor altars. They represented it under the figure of a woman, who held the sun in one hand and the moon in the other; her symbols were a phoenix, globe, and elephant.

ETESLÆ, or **ETESIAN winds**, are such as blow at stated times of the year, from what part soever of the compass they come. They are so called from the Greek word *ἔτος*, "year," being yearly or anniversary winds, such as our seamen call *monsoons* and *trade-winds*, which in some parts of the world continue constantly blowing for certain stated seasons of the year. Thus, the north winds, which, during the dog-days, constantly blow upon the coasts of Egypt, and hinder all ships from sailing out of Alexandria for that season, are called *etesie* in Cæsar's Commentaries. In other authors, the west and east winds are called *etesie*, when they continue blowing for certain seasons of the year.

Cælius endeavours to prove that those winds are properly *etesian* which blow from that part of the horizon which is between the north and west about the time of the solstice. In ancient writers, they are represented as of a very mild and gentle nature; and were cal-

led by mariners *forniculosi* and *delicati*, from their sleep. Ethi ball
ing or ceasing to blow in the night.

ETHELBALD,
ETHELBERT,
ETHELRED,
ETHELWOLF,
ETHER,
ETHERIAL,
ETHERIDGE (Sir George), a celebrated wit and comic genius in the reigns of Charles II. and James II. descended from an ancient family in Oxfordshire, and born in 1636. He travelled in his youth; and, not being able to confine himself to the study of the law, devoted himself to the gayer accomplishments. His first dramatic performance, the Comical Revenge, or Love in a Tub, appeared in 1664, and introduced him to the leading wits of the time: in 1668, he produced a comedy called *She would if he could*; and, in 1676, he published his last comedy, called the Man of Mode, or Sir Fopling Flutter; which is perhaps the most elegant comedy, and contains more of the real manners of high life than any one the English stage was ever adorned with. This piece he dedicated to the beautiful duchess of York, in whose service he then was; and who had so high a regard for him, that when, on the accession of James II. she came to be queen, she procured his being sent ambassador first to Hamburg, and afterwards to Ratibon, where he continued till after his majesty quitted the kingdom. Our author being addicted to certain gay extravagances, had greatly impaired his fortune; to repair which, he paid his addresses to a rich widow: but she, being an ambitious woman, had determined not to condescend to a marriage with any man who could not bestow a title upon her; on which account he was obliged to purchase a knighthood. None of the writers have exactly fixed the period of Sir George's death, though all seem to place it not long after the Revolution. Some say, that on this event he followed his master king James into France, and died there; but the authors of the Biographia Britannica mention a report, that he came to an untimely death by an unlucky accident at Ratibon; for that after having treated some company with a liberal entertainment at his house there, where he had taken his glass too freely, and being, through his great complaisance, too forward in waiting on his guests at their departure, flushed as he was, he tumbled down stairs and broke his neck, and so fell a martyr to mirth and jollity. As to Sir George's literary character, he certainly was born a poet, and seems to have been possessed of a genius whose vivacity needed no cultivation: for we have no proofs of his having been a scholar. His works, however, have not escaped censure on account of that licentiousness which in general runs through them, which renders them dangerous to young unguarded minds; and the more so, for the lively and genuine wit with which it is gilded over, and which has therefore justly banished them from the purity of the present stage.

ETHICS, the doctrine of manners, or the science of moral philosophy. The word is formed from *ἠθικός*, *more*, "manners;" by reason the scope or object thereof is to form the manners. See **MORAL PHILOSOPHY**.

ETHIOPIA, a celebrated, though very much unknown

Ethiopia.

Ethiopia
The name
anciently
bestowed on
different
nations.

known empire of Africa, whose boundaries have never been exactly defined either by ancient or modern geographers. By some writers of antiquity the title of *Ethiopiæ* was given to all nations whose complexion was black: hence we find the Arabians as well as many other Asiatics sometimes falling under this denomination; besides a number of Africans whose country lay at a distance from Ethiopia properly so called. Thus the Africans in general were by these writers divided into the western or Hesperian Ethiopians, and those above Egypt situated to the east of the former; the latter being much more generally known than the former, by reason of the commerce they carried on with the Egyptians.

2
Different
names of
Ethiopia.

From this account we may easily understand why there should be such a seeming disagreement among ancient authors concerning the situation of the empire of Ethiopia, and likewise why it should pass under such a variety of names. Sometimes, for example, it was named *India*, and the inhabitants *Indians*; an appellation likewise applied to many other distant nations. It was also denominated *Atlantia* and *Etheria*, and in the most remote periods of antiquity *Cephænia*; but more usually *Abasene*, a word somewhat resembling *Abassia* or *Abyssinia*, two of its modern names. On the other hand, we find Persia, Chaldaea, Assyria, &c. styled *Ethiopia* by certain writers; and all the countries extending along the coasts of the Red Sea were promiscuously denominated *India* and *Ethiopia*. By the Jews the empire of Ethiopia was styled *Cush* and *Ludim*.

3
Situation of
Ethiopia
Propria.

Notwithstanding this diversity of appellations, and vast diffusion of territory ascribed to the Ethiopians, there was one country to which the title was thought more properly to belong than to any of the rest; and which was therefore called *Ethiopia Propria*. This was bounded on the north by Egypt, extending all the way to the lesser cataract of the Nile, and an island named *Elephantine*; on the west it had Libya Interior; on the east the Red Sea, and on the south unknown parts of Africa; though these boundaries cannot be fixed with any kind of precision.

4
Different
nations in
Ethiopia.

In this country the ancients distinguished a great variety of different nations, to whom they gave names either from some personal property, or from their manner of living. The principal of these were, 1. The *Blemmyes*, seated near the borders of Egypt; and who, probably from the shortness of their necks, were said to have no heads, but eyes, mouths, &c. in their breasts. Their form, somehow or other, must have been very extraordinary, as we learn from Vopiscus, who gives an account of some of the captives of this nation brought to Rome. 2. The *Nobates*, inhabiting the banks of the Nile near the island Elephantine already mentioned, said to have been removed thither by Oasus to repress the incursions of the Blemmyes. 3. The *Trogodytes*, by some writers said to belong to Egypt, and described as little superior to brutes. 4. The *Nubians*, of whom little more is known than their name. 5. The *Pigmies*, by some supposed to be a tribe of Trogodytes; but by the most approved writers placed on the African coast of the Red Sea. 6. The *Aualite* or *Abalite*, of which we know nothing more than that they were situated near the Abaltic gulf. 7. The *Struthiophagi*, so called from their feeding upon ostriches, were situated to the south of the Memnonæ. 8. The *Acri-*

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dophagi; 9. *Chelonophagi*; 10. *Ichthyophagi*; 11. *Cynomolgi*; 12. *Elephantophagi*; 13. *Rhivrophagi*; 14. *Spermatoophagi*; 15. *Hylophagi*; and, 16. *Ophiophagi*: all of whom had their names from the food they made use of, viz. locusts, tortoises, fish, bitch's milk, elephants; roots, fruits, or seeds, and serpents. 17. The *Hylogones*, neighbours to the Elephantophagi, and who were so savage that they had no houses, nor any other places to sleep in but the tops of trees. 18. The *Pamphagi*, who used almost every thing indiscriminately for food. 19. The *Agriophagi*, who lived on the flesh of wild beasts. 20. The *Anthrophagi*, or man-eaters, are now supposed to have been the Caffres, and not any inhabitants of Proper Ethiopia. 21. The *Hippophagi*, or horse-eaters, who lay to the northward of Libya Incognita. 22. The *Macrobi*, a powerful nation, remarkable for their longevity; some of them attaining the age of 120 years. 23. The *Sambri*, situated near the city of Tenuphis in Nubia upon the Nile; of whom it is reported that all the quadrupeds they had, not excepting even the elephants, were destitute of ears. 24. The *Ajache*, a people inhabiting the mountainous parts, and continually employed in hunting elephants. Besides these, there were a number of other nations or tribes, of whom we scarce know any thing but the names; as the Gapachi, Ptoemphanes, Catadupi, Pechini, Catadræ, &c.

In a country inhabited by such a variety of nations, Of the first all in a state of extreme barbarism, it is rather to be wondered that we have any history at all, than that it is not more distinct. It has already been observed, that the Jews, from the authority of the sacred writers no doubt, bestowed the name of *Cush* upon the empire of Ethiopia; and it is generally agreed that Cush was the great progenitor of the inhabitants. In some passages of scripture, however, it would seem that *Cush* was an appellation bestowed upon the whole peninsula of Arabia, or at least the greater part of it. In others, the word seems to denominate the country watered by the Araxes, the seat of the ancient Scythians or Cuthites; and sometimes the country adjacent to Egypt on the coast of the Red Sea.

A number of authors are of opinion, that Ethiopia received its first inhabitants from the country lying to the east of the Red Sea. According to them, the descendants of Cush, having settled in Arabia, gradually migrated to the south-eastern extremity of that country; whence, by an easy passage across the straits of Babelmandel, they transported themselves to the African side, and entered the country properly called *Ethiopia*: a migration which, according to Eusebius, took place during the residence of the Israelites in Egypt; but, in the opinion of Syncellus, after they had taken possession of Canaan, and were governed by judges. Mr Bruce makes mention of a tradition among the Abyssinians, which, they say, has existed among them from time immemorial, that very soon after the flood, concerning Cush the grandson of Noah, with his family, passed through Atbara, then without inhabitants, till they came to the ridge of mountains which separates that country from the high lands of Abyssinia. Here, still terrified with the thoughts of the deluge, and apprehensive of a return of the same calamity, they chose to dwell in caves made in the sides of these mountains, rather than trust themselves in the plains of Atbara;

6
Peopled
originally
from Ara-
bia.

7
Abyssinian
tradition
concerning

Ethiopia.

bara; and our author is of opinion, that the tropical rains, which they could not fail to meet with in their journey southward, and which would appear like the return of the deluge, might induce them to take up their habitations in these high places. Be this as it will, he informs us that it is an undoubted fact, "that here the Cushites, with unparalleled industry, and with instruments utterly unknown to us, formed to themselves commodious, yet wonderful, habitations in the heart of mountains of granite and marble, which remain entire in great numbers to this day, and promise to do so till the conflagration of all things."

8
Principal
habitations
of the
Cushites.

9
Description
of the city
of Axum.

The Cushites having once established themselves among these mountains, continued to form habitations of the like kind in all the neighbouring ones; and thus following the different chains (for they never chose to descend into the low country), spread the arts and sciences, which they cultivated, quite across the African continent from the eastern to the western ocean. According to the tradition above-mentioned, they built the city of Axum early in the days of Abraham. This, though now an inconsiderable village, was anciently noted for its superb structures, of which some remains are still visible. Among these are some belonging to a magnificent temple, originally 110 feet in length, and having two wings on each side; a double porch; and an ascent of 12 steps. Behind this stand several obelisks of different sizes, with the remains of several others which have been destroyed by the Turks. There is also a great square stone with an inscription, but so much effaced that nothing can be discovered excepting some Greek and Latin letters, and the word *Basilina*. Mr Bruce mentions some "prodigious fragments of colossal statues of the dog-star" still to be seen at this place; "and *Sair* (adds he), which, in the language of the Troglodytes, and in that of the low country of Meroe, exactly corresponding to it, signifies a dog, instructs us in the reason why this province was called *Sirè*, and the large river which bounds it *Sirù*."

10
Meroe why
named.

Soon after building the city of Axum, the Cushites founded that of Meroe, the capital of a large island or peninsula formed by the Nile, much mentioned by ancient historians, and where, according to Herodotus, they pursued the study of astronomy in very early ages with great success. Mr Bruce gives two reasons for their building this city in the low country after having built Axum in the mountainous part of Abyssinia. 1. They had discovered some inconveniences in their caves both in *Sirè* and the country below it, arising from the tropical rains in which they were now involved, and which prevented them from making the celestial observations to which they were so much addicted. 2. It is probable that they built this city farther from the mountains than they could have wished, in order to avoid the fly with which the southern parts were infested. This animal, according to Mr Bruce, who has given a figure of it, is the most troublesome to quadrupeds that can be imagined. He informs us, that it infests those places within the tropical rains where the soil is black and loamy, and no other place whatever. It is named *Zimb* (by whom we are not informed), and has not been described by any other naturalist. It is of a size somewhat larger than a bee, thicker in proportion, and having broader wings, placed separate like those of a fly, and quite colourless, or without any spots. The head

11
Description
of the pestilential fly.

is large, with a sharp upper jaw; at the end of which is a strong pointed hair about a quarter of an inch long; and the lower jaw has two of these hairs: all of which together make a resistance to the finger equal to that of a strong hog's bristle. One or all of these hairs are used as weapons of offence to the cattle; but what purpose they answer to the animal itself, our author does not say. So intolerable, however, are its attacks to the cattle, that they no sooner hear its buzzing, than they forsake their food, and run about till they fall down with fright, fatigue, and hunger. Even the camel, though defended by a thick and strong skin with long hair, cannot resist the punctures of this insect; which seem to be poisonous, as they produce large putrid swellings on the body, head, and legs, which at last terminate in death. To avoid this dreadful enemy, the cattle must all be removed as quick as possible to the sandy parts of Atbara, where they stay as long as the rains last, and where this dreadful enemy never ventures to follow them. The elephant and rhinoceros, who, on account of the quantity of food they require, cannot remove to these barren places, roll themselves in the mud, which, when dry, coats them over so hard, that they are enabled to resist the punctures of the insect; though even on these some tubercles are generally to be met with, which our author attributes to this cause. Mr Bruce is of opinion, that this is the fly mentioned by Isaiah, chap. vii. 18. 19. "And it shall come to pass, in that day, that the Lord shall hiss for the fly that is in the uttermost part of the rivers of Egypt; and they shall come and shall rest all of them in the desolate valleys, and in the holes of the rocks, and upon all thorns, and upon all bushes." "That is (says Mr Bruce), they shall cut off from the cattle their usual retreat to the desert, by taking possession of these places, and meeting them there, where ordinarily they never come, and which therefore are the refuge of the cattle."

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Meroe, which lay in N. Lat. 16°, the exact limit of the tropical rains, was without the bounds assigned by nature to these destructive insects; and consequently a place of refuge for the cattle. Mr Bruce, on his return through the desert, saw at Gerri, in this latitude, ruins, supposed to be those of Meroe, and caves in the mountains immediately above them; for he is of opinion, that they did not abandon their caverns immediately after they began to build cities. As a proof of this, he mentions that Thebes, in Upper Egypt, was built by a colony of Ethiopians; and that near the ruins of that city, a vast number of caves are to be seen even up to the top of a mountain in the neighbourhood: all of which are inhabited at this day. By degrees, however, they began to exchange these subterranean habitations for the cities they built above ground; and thus became farmers, artificers, &c. though originally their sole employment had been commerce.

On this subject Mr Bruce has given a very curious Of the magnificence of the ancient Egyptians. The Indians and Egyptians has been celebrated from the most remote antiquity, without any account of the sources from whence all this wealth was derived: and indeed it must be owned, that in all histories of these people, there is a strange deficiency in this respect. The kings, we are to suppose, derived their splendour

12

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splendor and magnificence from their subjects; but we are quite at a loss to know whence their subjects had it: and this seems the more strange, that in no period of their history are they ever represented in a poor or mean situation. Nor is this difficulty confined to these nations alone. Palestine, a country producing neither silver nor gold, is represented by the sacred writers as abounding in the early ages with both those metals in a much greater proportion than the most powerful European states can boast of, notwithstanding the vast supplies they derive from the lately discovered continent of America. The Assyrian empire, in the time of Semiramis, was so noted for its wealth, that M. Montefquieu supposes it to have been obtained by the conquest of some more ancient and richer nation; the spoils of which enriched the Assyrians, as those of the latter afterwards did the Medes. This, however, Mr Bruce very justly observes, will not remove the difficulty, because we are equally at a loss to know whence the wealth was derived to that former nation; and it is very unusual to find an empire or kingdom of any extent enriched by conquest. The kingdom of Macedon, for instance, though Alexander the Great over-ran and plundered in a very short time the richest empire in the world, could never vie with the wealth of Tyre and Sidon. These last were commercial cities; and our author justly considers commerce as the only source from whence the wealth of a large kingdom ever was or could be derived. The riches of Semiramis, therefore, were accumulated by the East India trade centring for some time in her capital. While this was suffered to remain undisturbed, the empire flourished: but by an absurd expedition against India itself, in order to become mistress at once of all the wealth it contained, the loss that which the really possessed; and her empire was soon after entirely ruined. To the same source he attributes the riches of the ancient Egyptians; and is of opinion, that Sesostris opened up to Egypt the commerce with India by sea; though other authors speak of that monarch in very different terms. As the luxuries of India have some how or other become the objects of desire to every nation in the world, this easily accounts for the wealth for which Egypt has in all ages been so much celebrated, as well as for that with which other countries abounded; while they served as a medium for transmitting these luxuries to other nations, and especially for the riches of those which naturally produced the Indian commodities so much sought after. This was the case particularly with Arabia, some of the productions of which were very much coveted by the western nations; and being, besides, the medium of communication between the East Indies and western nations, it is easy to see why the Arabian merchants soon became possessed of immense wealth.

Besides the territories already mentioned, the Cushites had extended themselves along the mountains which run parallel to the Red Sea on the African side; which country, according to Mr Bruce, has "in all times been called *Saba*, or *Azabo*, both which signify *South*;" an epithet given from its lying to the southward of the Arabian gulf, and which in ancient times was one of the richest and most important countries in the world. "By that acquisition (says our author), they enjoyed all the perfumes and aromatics in the east; myrrh, and frankincense, and cassia; all which

grew spontaneously in that stripe of ground from the Bay of Bilur west of Azab to Cape Gardafan, and then southward up in the Indian ocean, to near the coast of Melinda, where there is cinnamon, but of an inferior kind." As the Cushites or Troglodytes advanced still farther south, they met not only with mountains, in which they might excavate proper habitations, but likewise with great quantities of gold and silver furnished by the mines of Sofala, which, our author says, furnished "large quantities of both metals in their pure and unmixed state, lying in globules without any alloy or any necessity of preparation or separation." In other parts of his work, he labours to prove Sofala to have been the *Ophir* mentioned in scripture.

Thus the Ethiopians, for some time after their settlement, according to Mr Bruce, must have been a nation of the first importance in the world. The northern colonies from Meroe to Thebes built cities, and made improvements in architecture; cultivated commerce, agriculture, and the arts; not forgetting the science of astronomy, for which they had an excellent opportunity by reason of the clearness of the sky in the Thebaid. Their brethren farther to the south, or those who inhabited Ethiopia properly so called, were confined for six months to their caves by reason of the tropical rains, whence they were naturally led to pursuits of another kind. "Letters", at least one kind of them, and arithmetical characters (we are told), were invented by this middle part of the Cushites; while trade and astronomy, the natural history of the winds and seasons, were what necessarily employed that part of the colony established at Sofala most to the southward."

While the Cushites were thus employed at home in collecting gold, gathering and preparing spices, &c. these commodities were sent abroad into other countries by another set of people named *Shepherds*, who acted as carriers to them, and who afterwards proved so formidable to the Egyptians†. These differed in their appearance from the Ethiopians, having long hair, and the features of Europeans; and were of a very dark complexion, though not at all like the blackmoors or negroes. They lived in the plain country in huts or moveable habitations, attending their cattle, and wandering up and down as various circumstances required. By acting as carriers to the Cushites, they became a great and powerful people, possessing vast numbers of cattle, as well as a very considerable extent of territory. They possessed a stripe of land along the Indian ocean; and to the northward of that, another along the Red Sea: but their principal habitation was the flat part of Africa between the northern tropic and the mountains of Abyssinia, which country is now called *Baja*. This reaches from Masuah along the sea-coast to Suakem; then turns westward, and continues in that direction, having the Nile on the south, the tropic of Cancer on the north, with the deserts of Selima and Libya on the west. The next district belonging to these people was Meroe, now called *Albara*, lying between the rivers Nile and Atabaras. A third district, now called *Derkin*, is a small plain lying between the river Mareb on the east and Atbara on the west. But the most noble and warlike of all the Shepherds were those who possessed the mountains

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¹³ The Ethiopians at first a civilized and learned people.

¹⁴ Bruce's Travels, l. p. 383.

¹⁵ Account of the Ethiopian Shepherds.

* See Egypt, n° 2.

¹⁵ Different classes of them. mountains of Habab, reaching from the neighbourhood of Masuah to Suakem; which district is still inhabited by them.

These *Shepherds*, according to our author, were distinguished by several different appellations, which may be supposed to denote different degrees of rank among them. Those called simply *Shepherds*, our author supposes to have been the common sort who attended the flocks. Another set were called *Hyefos* or *Ayefos*, signifying "armed shepherds," who are supposed to have been the soldiers. A third were named *Agag*, supposed to be the chiefs or nobles of these armed shepherds; whence the title of *king of kings*, according to Mr Bruce, is derived; and he supposes *Agag* killed by Samuel, to have been an Arabian shepherd.

The building of Carthage augmented the power of the *Shepherds* to a considerable degree, by reason of the vast quantity of carriage naturally belonging to a place of such extensive commerce, and which fell into the hands of the *Lehabim*, *Lubim*, or *Libyan* peasants. An immense multitude of camels, in the early ages, answered the purpose of navigation: and thus we find that commerce was carried on by the *Ishmaelites* as early as the days of Joseph from the southern extremity of the Arabian peninsula. These *Shepherds*, however, though generally the friends and allies of the Egyptians, who were also *Cushites*, sometimes proved very bitter enemies to them, as is related in the history of that country. The reason of this may be deduced from the great opposition betwixt their manners and customs. The Egyptians worshipped black cattle, which the *Shepherds* killed and used as food; the latter worshipped the heavenly bodies, while the Egyptians were the grossest idolaters, and worshipped idols of all kinds that can be imagined. Hence a mere difference in religion might occasion many bloody quarrels; though if the above account can be depended upon as authentic, it is natural to imagine that the mutual connection of interest should have cemented their friendship, whatever difference there might happen to be in opinions of any kind.

Besides the *Cushites* and *Shepherds*, however, we must now seek for the origin of those different nations which have already been mentioned. Mr Bruce allows that there are various nations inhabiting this country, who are fairer than either the *Cushites* or the *Shepherds*, and which, though they have each a particular name, are all known by the general title of *Habek*: which may be translated by the Latin word *convence*, signifying a number of distinct people meeting accidentally in one place; and which our author maintains against Scaliger, Ludolf, and a number of others, to be a very just translation, and exceedingly consonant to the history of the country.

The most authentic ancient history of this country, according to Mr Bruce, is the chronicle of Axum: the character of which, among the modern Abyssinians, stands next to the sacred writings themselves; and consequently must be esteemed the highest Abyssinian authority we have on the subject. According to this book, there was an interval of 5500 years between the creation of the world and the birth of Christ; 1808 years before which last event the empire of Abyssinia or Ethiopia received its first inhabitants. Two hundred years after its settlement, it was so de-

stroyed by a flood that it received the name of *Ourd Midra*, or a country laid waste; "or (says our author) as it is called in scripture itself, a land which the waters or floods had spoiled;" (Isaiah xvii. 2.) The peopling try laid of the country was finished about 1400 years before wate by a Christ, by the settlement of a great number of people, speaking different languages, who sat down peaceably in the high lands of Tigre, in the neighbourhood of the *Shepherds*, with whom they were in friendship. These people, according to tradition, came from Palestine; and our author is inclined to believe the whole of the relation to be true, as the time coincides with the expulsion of the Canaanitish nations by Joshua, which happened about 1490 B. C. ten years before which there had been, according to Paulanias, a flood in Ethiopia which occasioned prodigious desolation. Ethiopia, he thinks, would afford the most ready asylum for the fugitive Canaanites, as they must have long had a commercial intercourse with that country; and he supports the opinion likewise from what Procopius mentions of two pillars extant in his time, on the coast of Mauritania, with the following inscription in the Phœnician language: "We are Canaanites, flying from the face of Joshua, the son of Nun, the robber." The authenticity of these inscriptions, however, is much disputed, and therefore it cannot go a great way in establishing any historical point. The first and most considerable of the colonies above mentioned settled in the province of Amhara; the second in Damot, one of the southern provinces; the third in another province called *Lassa*, or *Tcheratz-Agaw*, from *Tchera* their principal habitation; and a fourth in the territory of Gafat.

Our author goes on to prove, that the Ethiopians in ancient times were not only the most learned people in the world, but that they spoke the original language, and were the inventors of writing. In what manner they came to degenerate from this character, and into their present state of barbarity, cannot be known; this being a phenomenon equally unaccountable with the degeneracy of the Egyptians. According to some authors, the Ethiopians were conquered by Moses: of which transaction we have the following account. Before the time of that legislator, the Ethiopians possessed the country of Thebais in Egypt; but, not content with this, they made an irruption into the Lower Egypt, and penetrated as far as Memphis; where, having defeated the Egyptians, they threatened the kingdom with total destruction. The Egyptians, by the advice of their oracles, put Moses at the head of their forces; who immediately prepared for invading the enemy's country. The Ethiopians imagined that he would march along the banks of the Nile; but Moses chose rather to pass through some of the interior countries, though greatly infested with serpents, and where consequently his march must be attended with much danger. To preserve his men, he constructed a number of cheltis or panniers of the Egyptian reed papyrus, which he filled with the birds named *Ibir*, celebrated for their antipathy to serpents. As soon as he approached the tract abounding with these reptiles, a sufficient number of the birds were let out, who presently cleared the way for the army by destroying the serpents. Thus the Ethiopians were surprised in their own country where they had

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dreaded no invasion; their forces, being defeated in the field, were at last shut up in the capital Meroc, a city almost impregnable, by being surrounded with three rivers, the Nile, Aftapus, and Aftaboras. The daughter of the Ethiopian monarch, however, having an opportunity of seeing Moses from the walls, fell in love with him, and offered to deliver up the city, provided he would swear to marry her. With this requisition the Jewish legislator complied; but treated the inhabitants with great severity, plundering the city, and putting many of the inhabitants to death. After this he ravaged the whole country, dismantling all the places of strength; and having thus rendered the Ethiopians incapable of attempting any thing against other nations for a considerable time, he returned in triumph to Egypt, after an absence of ten years.

21
Of the
queen of
Sheba.

From the time of Moses to that of Solomon there is a chasm in the Ethiopic history. After this, however, we are furnished with some kind of regular accounts. The history commences with the queen of Sheba, who came to visit the Jewish monarch, and whom the Abyssinians suppose to have been sovereign of Ethiopia Propria: but Mr Bruce is of opinion that she was only sovereign of that territory on the eastern coast of Africa named *Saba*, which he says ought to be her title instead of *Sheba*. In favour of this opinion he likewise urges, that it was customary for the Sabaeans, or inhabitants of the African district named *Saba*, to be governed by women; whereas those who inhabited the opposite side of the Arabian gulf, and who were named *Sabean Arabs* or *Homerites*, were not only governed by kings, but would not allow their sovereigns to go abroad any where under pain of being stoned to death. The Abyssinians, as has been already hinted, claim her for their sovereign; and he informs us, that having received an account from Tamerin, an Ethiopian merchant, of the surpassing wisdom and wealth of Solomon, he undertook the journey mentioned in Scripture, to ascertain the truth of the report. In this she was attended by a great many of her nobility, carrying along with her also magnificent presents for the monarch she intended to visit. According to the Abyssinian historians, she was a pagan at the time this journey was undertaken; but being struck with admiration at the sight of Solomon's grandeur, and the wisdom he displayed, she became a convert to the true religion. Another part of her history, by no means inconsistent with the character of Solomon, is, that she returned in a state of pregnancy; and within a year was delivered of a son, named *David* by Solomon; but by his mother *Menick*, *Menelch*, or *Menlebeck*; that is, *another self*. When he grew up, he was sent to be educated at the court of his father Solomon; where having staid some time, he was accompanied home by many doctors of the law, and other Israelites of distinction, particularly Azariah the son of Zadoc the high-priest. By these the Jewish religion was established in Abyssinia, where it continued till the introduction of Christianity. The princefs we speak of is named *Makeda*, *Bulkis*, or *Fulkis*, by the Abyssinians. By our Saviour, and in the Ethiopic version of the Scriptures, she is styled *The Queen of the South*, and is said to have come from the uttermost parts of the earth or of the habitable world. Hence the compilers of the Universal History have inferred,

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that the princefs styled *The Queen of Sheba* in Scripture was really sovereign of Ethiopia. "Ethiopia (say they) is more to the south of Judea than the territory or kingdom of Saba in Arabia Felix; consequently has a better claim than that country for the dominions of the princefs whom our Saviour calls *The Queen of the South*. Ethiopia is styled the *remotest part of the habitable world* by Herodotus and Strabo; and therefore better agrees with what our Saviour has said of the queen of Sheba, that she came from 'the uttermost parts of the earth,' than Arabia. Nor can it be deemed a sufficient reply to this argument, that Arabia Felix was the uttermost part of the earth in respect to Judea, since it was bounded by the Red Sea: for that not only Egypt, but even Ethiopia, regions beyond that sea, were known to, and had a communication with, the Jews, both before and in our Saviour's time, is indisputably clear. Lastly, from what has been suggested, it appears no improbable conjecture, that Judasim was not only known, at least in a part of Ethiopia, but nearly related to the established religion there, at the beginning of the apostolic age, if not much earlier. After all, these two opinions, so contrary in appearance, may be made consistent without great difficulty; since it is agreed, that Arabia and Ethiopia have anciently borne the same name, been included during certain intervals in one empire, and governed by one prince. Part of the Arabs and Ethiopians had the same origin, and very considerable numbers of the Abaseni transported themselves from Arabia Felix into Ethiopia; a circumstance which sufficiently proves the intercourse that formerly subsisted between the Cushites or Ethiopians of Asia and Africa."

The Abyssinian historians farther inform us, that the young prince Menilek was anointed and crowned king in the temple of Jerusalem, before he returned to his own country; that Azarias was constituted high-priest; that he brought with him an Hebrew transcript of the law; and though this book is now lost, having been burnt along with the church at Axum, the office is still continued in the line of Azarias, whose successors are styled *Nebrits*, *high-priests*, or *keepers of the church*, in that city; both church and state being modelled exactly after that of Jerusalem. Makeda continued to enjoy the sovereignty for 40 years; and the last act of her reign was to settle the succession to the throne. By this act the crown was declared hereditary in the family of Solomon for ever; it was also determined, that after her no woman should be intitled to wear the crown or act as sovereign of the country; but that the sovereignty should descend to the most distant heirs male, rather than to the females, however near; which two articles were to be considered as fundamental laws of the empire, not to be abolished. Lastly, that the male heirs of the royal family should always be sent prisoners to a high mountain, where they were to be confined till they should be called to the throne, or as long as they lived. This custom, according to Mr Bruce, was peculiar to Abyssinia; the neighbouring Shepherds being accustomed to have women for their sovereigns, which prevailed in the last century, and perhaps does so at present.

Makeda having established these laws in such a manner as not to be revocable, died in the year 986 B. C. The transactions of her son Menilek after his accession

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22
Ethiopia
conquered
by Shishak.

are not pointed out, farther than that he removed his capital to Tigré. His reign can by no means be accounted prosperous; since in his time the empire was invaded by Shishak or Sefac the king of Egypt, who plundered the temple of Jerusalem under Rehoboam. The like fate attended a rich temple which had been built at Saba the capital of the Ethiopians empire, and which might very probably occasion the removal of the imperial seat to Tigré, as already mentioned. It is indeed pretty plain from Scripture, that Ethiopia, or great part of it, was subject to this monarch; as the Ethiopians or Cushites mentioned in his army which invaded Judæa, are joined with the Lubims or Libyans, and must therefore be accounted inhabitants of Ethiopia Proper. This is indeed no small confirmation of the opinion of Sir Isaac Newton, who agrees with Josephus in supposing Shishak to have been the celebrated Sesostris of profane historians. Thus far we are certain, that in the passage of Scripture just now alluded to, the sacred historian indirectly ascribes the sovereignty of Ethiopia to Shishak; and we do not find it any where hinted that another Egyptian monarch was possessed of this sovereignty. Herodotus also plainly tells us, that Sesostris was master of Ethiopia, and that no other Egyptian but himself ever possessed that empire.

23
Revolutions after
the time of
Shishak.

During the reign of Shishak we know no particulars concerning the Ethiopians; but after his death, Sir Isaac Newton is of opinion that they defended Egypt against the Libyans, who had taken an opportunity of invading the country during the civil war which took place on the death of that great conqueror. In about ten years afterwards, however, according to the same author, they became aggressors; drove the successor of Shishak in the Nile, and seized on the whole kingdom; at which time Libya fell also into their hands. In the time of Afa king of Judah, we find the combined host of the Ethiopians and Lubims or Libyans making an attack on the territories of that prince, to the number of more than a million. This may be reckoned a considerable confirmation of the piece of history just mentioned; as it is not easy to conceive how the two should combine in such a manner, unless Zerah was master of both. The total overthrow which the allied army received from Afa, gave the inhabitants of Lower Egypt an opportunity of revolting; who being sustained by an army of 20,000 auxiliaries from Phœnicia and Palestine, obliged Memnon, supposed to be the same with Amenophis, to retire to Memphis. Soon after this he was forced to leave Egypt altogether, and to retire into Ethiopia; but in about 13 years he returned with his son Ramesses at the head of a powerful army, and obliged the Canaanitish forces to retire out of the Lower Egypt; a transaction denominated by the Egyptian writers the

24
Defeat of
Zerah by
Afa king
of Judah.

second expulsion of the Shepherds.

25
Of Menes
and his suc-
cessors.

Sir Isaac Newton is of opinion, that the Egyptian princes Menes, Memnon, and Amenophis, were the same person; and that by him Memphis was either originally built or first fortified, in order to prevent the Egyptians from entering Ethiopia. He is also supposed to have been the son of Zerah, and to have died in a very advanced age about 90 years after the decease of Solomon. Thus, according to Sir Isaac Newton's chronology, the most remarkable transac-

tions of antiquity will be brought lower by ages than by the usually received computations. According to this, the Argonautic expedition happened in the time of Amenophis; though some Greek writers inform us, that the same prince assisted Priam king of Troy with a body of forces. He was succeeded by Ramesses, already mentioned, who built the northern portico of the temple of Vulcan at Memphis. The next was Moeris; who adorned Memphis, and made it the capital of his empire, about two generations after the Trojan war. Cheops, Caphrenus, and Mycerinus, succeeded in order to Moeris; the last being succeeded by his sister Nitocris. In the reign of Asychis her successor, both Ethiopia and Assyria revolted from Egypt; which, being now divided into several small kingdoms, was quickly subdued by Sabacon or So, the emperor of Ethiopia. This monarch, soon after his accession to the throne of Egypt, allied himself with Hohen king of Israel; by which means the latter was induced to revolt from the Assyrians; and in consequence of this, an end was put to the kingdom of Israel by Sialmaneser king of Assyria, in the 24th year of the era of Nabonassar, and 720th before the commencement of the Christian era. According to Herodotus, this monarch voluntarily resigned the crown of Egypt after he had enjoyed it 50 years; but Africanus relates, that after a reign of eight years, he died in Egypt, in the ninth year of Hezekiah king of Judah. His successor Sethon, supposed to be the Sevechus of Manetho, advanced to Pelusium with a powerful army against Sennacherib king of Assyria; when the bowstrings of the Assyrians were gnawed in pieces by a great number of rats or mice, and thus they were easily defeated with great slaughter by the Egyptians. Hence Herodotus informs us, that the statue of Sethon which he saw in Egypt had a mouse in its hand. Sir Isaac Newton, however, explains the whole in an allegorical manner. As the mouse among the Egyptians was a symbol of destruction, he conjectures, that the Assyrians were on this occasion overthrown with great slaughter; and that Sethon, in conjunction with Terhakah, either king of the Arabian Cushites, or a relation of Sethon and his viceroy in Ethiopia Proper, surprised and defeated Sennacherib betwixt Libnah and Pelusium, making as great slaughter among his troops as if their shields and bowstrings had been destroyed by mice.

26
Sennacherib defeated by Sethon.

In the 78th year of the era of Nabonassar, the empire of Ethiopia was subdued by Esarhadon king of Assyria; who held it three years, committing enormous cruelties both in that country and in Egypt. After his death the Ethiopians shook off the yoke, and maintained their independency till the time of Cyrus the Great the first king of Persia; who, according to the Greek historian Xenophon, seems to have also been sovereign of Ethiopia. After his death they revolted, and his son Cambyses unsuccessfully attempted to reduce them. Herodotus informs us, that before he undertook this expedition, he sent some of the Iachthyophagi ambassadors to the king of the Macrobii or long-lived Ethiopians, under pretence of soliciting his friendship, but in reality to observe the strength of the country. Of this the Ethiopian prince was aware, and told the ambassadors that he knew their design, reproached Cambyses with his injustice and ambition, and gave them his bow; telling them at the same time, that the

27
Ethiopia
subdued by
Esarhadon.

28
Unsuccessful expedition of Cambyses against the Ethiopians.

Persians.

Ethiopia

Persians might think of invading Ethiopia when they could easily bend it; and in the mean time, that their master ought to thank the gods who had never inspired the Ethiopians with a desire of extending their territories by conquest. Cambyfes had sent by the ambassadors a rich purple robe, gold bracelets, a box of precious ointment, a vessel full of palm wine, and other things, which he imagined would be acceptable to the Ethiopian monarch. But all these, excepting the wine, were despised. This, he owned, was superior to any liquor produced in Ethiopia; and he did not scruple to intimate, that the Persians, short-lived as they were, owed most of their days to the use of this excellent liquor. Being informed by the ambassadors, that a considerable part of the food made use of by the Persians was bread, he said that it was no wonder to find people who lived on *dung* unable to attain the longevity of the Macrobian Ethiopians. In short, the whole of his answer was so contemptuous and disgusting, that Cambyfes was filled with the greatest indignation; in consequence of which, he instantly began his march without taking time to make the necessary preparations, or even to procure provisions of any kind for his army. Thus a famine ensued among them; which at last became so grievous, that the soldiers were obliged to eat one another: and Cambyfes himself, finding his life in great danger, was obliged to give orders for marching back again; which was not accomplished without the loss of a great number of men. Another army which he sent on an expedition against Ammonia, in order to destroy the celebrated oracle of Jupiter Ammon, perished entirely in the deserts, being overwhelmed with the vast clouds of sand frequently raised there by the wind.

At this time, it is doubtful whether Cambyfes would have accomplished his purpose even if he had found it practicable to march into the heart of Ethiopia. This empire had but a short time before received a very considerable accession of strength by the desertion of 240,000 Egyptians who had been posted by Psammennus in different places on the frontiers. These not having been relieved for three years, had gone over at once to the emperor of Ethiopia, who placed them in a country disaffected to him; ordering them to expel the inhabitants, and take possession of their lands. Notwithstanding this, however, Sir Isaac Newton hints, that Cambyfes conquered Ethiopia about the 223d or 224th year of the era of Nabonassar; but his opinion in this respect does not appear to be well founded. We are told indeed, that the Persian monarch, notwithstanding the misfortunes he met with in the expedition above mentioned, did really make himself master of some of the Ethiopian provinces which bordered on Egypt; and that these, together with the Troglodytes, sent him an annual present of two chemises of unrefined gold, 200 bundles of ebony, five Ethiopian boys, and 20 elephants teeth of the largest size: but it appears improbable to the last degree, that even though Cambyfes had employed the whole of his reign in the attempt, he could have conquered the vast regions of Ethiopia Proper, Sennaar, and Abassia, which were all included in the Ethiopia of the ancients.

When Xerxes invaded Greece, we find his army, according to Herodotus, was partly composed of Ethiopians, of whom Herodotus mentions two distinct races

of people. One of these inhabited the Asiatic coast, and differed from the Indians only in their hair and language. Their arms were the same with those of India; they wore helmets made of the skins of horses, the ears and manes of which served them for tufts and plumes of feathers; their shields being made of the skins of cranes. The hair of the Asiatic Ethiopians was long, but that of the western tribes was frizzled. The latter were also differently armed, having darts lighted at one end and covered with leather. We are not informed particularly from what nations these troops were brought, nor whether they were natural subjects of the king of Persia or only auxiliaries: of consequence we can conclude nothing certain concerning the dominion of the Persian monarchs at this time over Ethiopia, farther than that they might possess some of the provinces next to Egypt; while the main body of the empire being in a state of independence, and unconnected with other parts of the world, is not taken notice of by the historians of those times.

Though Alexander the Great had a desire to know the sources of the Nile, he did not suffer himself to be diverted by this curiosity from pursuing his grand expedition into Persia. Ptolemy Euergetes, however, appears to have carried this curiosity to such an extremity as to invade Ethiopia for no other purpose. It is surprising that the particulars of this expedition are not recorded by any historian, as it appears by an inscription that he penetrated to the farthest parts of the empire, and conquered the most powerful nations in it. Of this we have the following account, which is looked upon by the best historians to be authentic. It was copied on the spot (being the western entrance to Adule, one of the cities of Ethiopia) by Cosmas Egyptian, or, as some call him, Cosmas Indicopleustes, in the time of the emperor Justin I. by order of Elebaan king of the Axumites, and of which the following account is given by the person who copied it. "Here (says he), facing the road to Axumia, stood a chair of white marble, consisting of a square base, a small thin column at each angle of this base, with a larger wreathed one in the middle, a seat or throne upon these, a back and two sides. Behind this chair there was a large stone three cubits high, which had sustained considerable injury from time. This stone and chair contained an inscription to the following purpose: 'Ptolemy Euergetes penetrated to the farthest parts of Ethiopia. He subdued Gaza, Agame, Signe, Ava, Tiamo or Tziamo, Gambela, Zingabene, Angabe, Tiama, Atliagaos, Calaa, Semene, Lafine, Zaa, Gabala, Atalino, Bega, the Tangait, Arine, Metine, Sefea, Rauso, Sulate, the territory of Rauso, and several other kingdoms. Among the nations he reduced, were some inhabiting mountains always covered with a deep snow; and others seated upon ridges of hills, from whence issued boiling steams and craggy precipices, which therefore seemed inaccessible. Having finally, after all these conquests, assembled his whole army at Adule, he sacrificed to Mars, Neptune, and Jupiter; for his great success, he dedicated this chair or throne to Mars.'

From the time of this conqueror to that of the emperor Augustus, we meet with nothing of any consequence relating to Ethiopia Proper. The Roman forces having about this time been drawn out of E-

Ethiopia.

32
Ethiopia
conquered
by Ptolemy
Euergetes.

29
Ethiopia at
this time a
powerful
empire.

30
Ethiopia
supposed by
Sir Isaac
Newton to
have been
conquered
by Camby-
ses.

31
Ethiopia
employed
by Xerxes.

33
Conquest
of Ethio-
pia by the
Romans.

Ethiopia.

gypt in order to invade Arabia, Candace queen of Ethiopia, or perhaps rather of the island or peninsula of Meroe, took the opportunity of their absence to make an irruption, with a numerous army, into the province of Thebais. As there was at that time no force to oppose her, she met for some time with great success; but hearing at last that Petronius, governor of Egypt, was in full march to attack her, she retired into her own dominions. Petronius pursued her as far as Pselcha, where with 10,000 men he gained an easy victory over 30,000 undisciplined Ethiopian savages, armed only with poles, hatchets, and other clumsy or insignificant weapons of a similar nature. This victory was soon followed by the reduction of several fortresses; however, as the Roman soldiers were excessively incommoded by the heat of the climate, Petronius, notwithstanding his success, was obliged at last to retire. Soon after, Candace sent ambassadors to Augustus himself with such magnificent presents, that the emperor is said to have been thereby induced to grant her a peace on her own terms. From this time the Romans accounted themselves masters of Ethiopia: Augustus was complimented on the great glory he had acquired; and that he had, by reducing a country till that time unknown even to the Romans, finished the conquest of Africa. No material alteration, however, took place in the affairs of Meroe in consequence of this conquest, whether real or pretended. Pliny informs us that it had been governed by queens, who bore the title of Candace, for several generations before that time; and so it continued to be afterwards, as we learn from Scripture, where we are informed that, in the reign of Tiberius, the sovereign of Ethiopia was still named Candace. Some indeed are of opinion that the Candace mentioned in the Acts of the Apostles was the same with her who had been conquered by Augustus; but this seems by no means probable, as the interval of time is by far too long to be allowed for the reign of a single princess.

From an anecdote of the debauched emperor Heliogabalus, who was accustomed to confine his favourites, by way of diversion, with old Ethiopian women, we may learn that some intercourse took place between the two empires, and probably that the Ethiopians owned some kind of subjection to the Romans. The Blemmyes, a gang of monstrous banditti, who inhabited the frontiers of Thebais, were vanquished by the emperor Probus: but, towards the close of the third century, we find them again become so powerful, that in conjunction with another nation called *Nobata*, who inhabited the banks of the Nile near the Upper Egypt, they committed such depredations in the Roman territories, that Dioclesian was obliged to assign lands to the latter, and to pay both of them a considerable sum annually, to desist from their former practices. These expedients did not answer the purpose; the savages continued their depredations till the time of the emperor Justinian, who treated them with more severity, and obliged them to remain at peace. We are told by Procopius, that before the time of Dioclesian, the Roman territories extended so far into Ethiopia, that their boundaries were not 23 days journey from the capital, so that probably the whole empire had been in a state of dependence on them.

From the time of this emperor to that of their con-

version to Christianity, we find nothing remarkable in the history of the Ethiopians. Three hundred and twenty-seven years are counted from the time of our Saviour to that of Abreha and Atzbelia, or from Abreha and Asba, who enjoyed the kingdom when the gospel was preached in Ethiopia by Frumentius. This converted man was a kinsman and companion of a philosopher named Meropius, a native of Tyre; who having travelled all over India, died on an island of the Red Sea. After his death Frumentius, with another named Ebedesius, who had also been his companion, were brought before the king of Ethiopia, to whom that island was subject. He took them into his service; making the one his treasurer and the other his butler. On the death of this prince, the queen conceived such a favour for them, that she refused to allow them to depart out of the kingdom; she committed the management of her affairs entirely to Frumentius, who made use of his influence to diffuse the Christian religion throughout the country, and at last was appointed bishop of Axuma. It is said, however, that the court and principal people, if not the nation in general, relapsed into idolatry, which continued to prevail till the year 521, when they were again converted by their king Adad, or Aidog.

The two princes Abreha and Asba, who reigned jointly in Ethiopia in the time of Frumentius, lived in such harmony together, that their friendship became almost proverbial. After being converted to Christianity, they adhered strictly to the orthodox doctrine, refusing to admit an Arian bishop into their country. In the time of the emperor Constantius, however, this heresy was introduced, and greatly favoured by that monarch; and an attempt was made to depose Frumentius on account of his refusal to embrace it.

The reign of these princes is remarkable for an expedition into Arabia Felix, called by the Mohammedan writers the war of the elephant, and which was undertaken on the following occasion: The temple of Mecca, situated nearly in the middle of the Arabian peninsula, had been held in the greatest veneration for near 1400 years; probably from the notion entertained by the people in the neighbourhood, that Adam pitched his tent on that spot. Here also was a black stone supposed to possess extraordinary faculty, as being that on which Jacob laid his head when he had the vision of angels. The most probable account of the real origin of this temple, according to Mr Bruce, is, that it was built by Sesostris, and that he himself was worshipped there under the name of Osiris.

On account of the veneration in which this tower and idol were held by the Arabians, Mr Bruce supposes that the thought was first suggested of making it the emporium of the trade between India and Africa; but Abreha, in order to divert it into another channel, built a very large temple near the Indian ocean in the country of the Homerites; and, to encourage the resort of people to this new temple, he bestowed upon it all the privileges of the former which stood in the city of Mecca. The tribe of Arabians named *Koreish*, in whose country Mecca stood, being exceedingly alarmed at the thoughts of having their temple deserted, entered the new one in the night, burned all that could be consumed, and besmeared the remains with human excrements. Abreha, provoked at this sacrilege,

Ethiopia.

35
Ethiopians
This converted
man was a kinsman
and companion of a
philosopher
named Meropius,
a native of Tyre;
who having tra-
velled all over India,
died on an island of
the Red Sea.
After his death
Frumentius, with
another named E-
bedesius, who had
also been his com-
panion, were brought
before the king of
Ethiopia, to whom
that island was
subject.

36
The two
kings re-
fused to ad-
mit Arian-
ism.

37
Account of
the war of
the ele-
phant.

34
Account of
the Blem-
myes.

Ethiopia.
38
Miraculous
destruction
of the E-
thio-
pian ar-
my.

crilege, assembled a considerable army, with which he invaded Mecca, himself appearing on a white elephant, from whence the war took its name already mentioned. The termination of the war, according to the Arabian historians, was miraculous. A vast number of birds named *Ababil* came from the sea, having faces like lions; each carrying in its claws a small stone about the size of a pea, which they let fall upon the Ethiopian army in such numbers, that every one of them was destroyed. At this time it is said that the small-pox first made its appearance; and the more probable account of the destruction of the Ethiopian army is, that they perished by this distemper.

The war of the elephant is supposed to have terminated in the manner above-mentioned about the year 360; from which time to that of Elefbaan, named also *Caleb*, and probably the same with the Adad or Adag already mentioned, we meet with nothing remarkable in the Ethiopic history. He engaged in a war with the Homerites or Sabæans in Arabia Felix; whom he overthrew in battle, and put an end to their kingdom; after which he embraced the Christian religion in token of gratitude for the success he had met with. In the time of this prince a violent persecution of the Christians took place in Arabia. The Jewish religion had now spread itself far into that peninsula; and in many places the professors of it were become absolute masters of the country, inasmuch that several Jewish principalities had been erected, the sovereigns of which commenced a severe persecution against the Christians. Among the rest, one Phineas distinguished himself by his cruelty, having prepared a great number of furnaces or pits filled with fire, into which he threw those who refused to renounce Christianity. The Christians applied for relief to the emperor Justin; but he being at that time engaged in a war with the Persians, could not interfere: however, in the year 522, he sent an embassy to Elefbaan, who was now also a member of the Greek church, intreating him to exert himself for the relief of the Christians of Arabia. On this the emperor commanded his general Abreha, governor of the Arabian province Yemen, to march to the assistance of Aretas, son to a prince of the same name whom Phineas had burnt; while he himself prepared to follow with a more considerable force. But before the arrival of the Ethiopian monarch, young Aretas had marched against Phineas, and entirely defeated him. In a short time afterwards the emperor himself arrived, and gave Phineas a second defeat: but notwithstanding these misfortunes, it does not appear that either the principality of Phineas or any of the other Jewish ones, was at this time overturned, though it seems to be certain, that at the time we speak of, the Ethiopians possessed part of the Arabian peninsula. According to the Arabian historians, the war of the elephant, with the miraculous destruction of the Ethiopian army already mentioned, took place in the reign of Elefbaan.

Some historians mention, that the Ethiopian monarchs embraced the doctrines of Mahomet soon after the impostor made his appearance; but this seems not to be well founded: though it is certain that the *Najashi* or Ethiopian governor of Yemen embraced Mohammedanism, and that he was related to the royal family. On this occasion, however, the Ethiopians

lost all the footing they once had in Arabia; the governors being expelled by Mohammed and his successors. They fled to the African side of the Red Sea with numbers of their subjects, where they erected several small kingdoms, as Adel, Wypo, Haden, Mara, of Arabia, and others which still continue.

During the conquests of the caliphs, the Jews were for some time every where driven out of their dominions, or oppressed to such a degree that they voluntarily left them. Ethiopia offered them an asylum: and in this country they became so powerful, that a revolution in favour of Judaism seemed ready to take place. One family had always preserved an independent sovereignty on a mountain named Samen, the royal residence being on the top of an high rock; and several other high and rugged mountains were used by that people as natural fortresses. Becoming by degrees more and more powerful, Judith the daughter of one of their kings formed a design of overturning the Ethiopian government, and setting aside the family of Solomon, who had hitherto continued to enjoy the sovereignty. This design was facilitated by several circumstances. The empire had been weakened by an unsuccessful war, famine, and plague; the throne was possessed by an infant; and the absurd custom of confining the whole royal family on a rock named *Damo*, gave her an opportunity of cutting them all off at once by surprising that place. Fortunately, however, the king himself escaped the general catastrophe, and was conveyed by some of the nobility of Amhara to the province of Xoa or Shoa; by which means the line of Solomon was preserved, and afterwards restored, though not till after a very considerable interval.

Judith having by this massacre established her own power, assumed the imperial dignity, though in direct opposition to an established and fundamental law of the empire already mentioned, that no woman should enjoy the sovereign power. The people, however, seemed to have submitted quietly to her government, as she sat on the throne for 40 years, and afterwards transmitted the sovereignty to her posterity; five of whom reigned successively in this country. We are not furnished with any particulars concerning their reigns; farther than that, during them, the people were greatly oppressed. By some means, of which historians have not given any account, another revolution took place, and a new set of usurpers, related to the family of Judith, but not their direct lineal descendants, succeeded to the throne. These were Christians, and governed with much greater lenity than the Jewish sovereigns; it had done; but still, being usurpers, none of their transactions are recorded in the Abyssinian annals, excepting those of Lalibala, who was accounted a saint. He lived in the end of the 12th or beginning of the 13th century, and proved a great prince. At that time the Christians in Egypt were grievously persecuted by the Saracens, who had a particular abhorrence at martyrs, builders, and stone-cutters; looking upon them as the chief promoters of idolatry by the ornaments they put upon their works. These were joyfully received by Lalibala; who, by affording them an asylum in his dominions, soon collected a great number. They were employed by him in hewing churches out of the solid rock, after the example of the ancient Troglodytic habitations; and many works of this

Ethiopia.
44
Ethiopians
driven out
several small
kingdoms, as
Adel, Wypo,
Haden, Mara,
of Arabia.

45
Number of
Jews in E-
thio-
pian in-
creased.

46
Royal fa-
mily of E-
thio-
pian
massacred
by Judith.

47
The king
escapes.

48
Judith
surps the
throne.

49
A new re-
volution
takes place.

50
Christians
persecuted
in Egypt
fly to E-
thiopia.

43
He is de-
feated.

40
Rever-
sion to
Christi-
an-
ty under
Elefbaan.
41
Christians
persecuted
in Arabia

41
Cruelty of
Phineas a
Jewish
prince.

Ethiopia.

Lalibala undertakes to diminish the stream of the Nile.

kind remain in the country to this day. He undertook, however, a still more difficult and arduous task; no less than that of lessening the stream of the Nile, and thus starving the whole kingdom of Egypt now in the hands of his enemies, and who persecuted those of his religion. From the account given by Mr Bruce of this project, it appears that there really is a possibility in nature of accomplishing it; not indeed by turning the course of the Nile itself, but by diverting that of many of its branches, which are the means of conveying into it the water supplied by the tropical rains, and by which it overflows its bank annually. We are likewise assured by the same author, that Lalibala succeeded in his enterprize so far as to divert the course of two large rivers from the Nile, and that they have ever since flowed into the Indian-ocean. He next proceeded to carry a level towards a lake named *Zacchia*, into which many rivers, whose streams contribute to increase that of the Nile, empty themselves; and had this been accomplished, there is no doubt that the loss of so much water would have been very sensibly felt by the Egyptians. According to most historians, this enterprizing monarch was prevented by death from putting his design in execution; though Mr Bruce informs us of a written account at Shoa, in which it was asserted, that he was dissuaded from it by certain monks, who told him, that by sending down such a quantity of water to the eastern and dry parts of Africa, these countries would soon become fertile and populous that they would rival the empire of Ethiopia, or at least withdraw their allegiance from it entirely. The remains of these works were seen by the Portuguese ambassador in 1522.

Refutation of the line of Solomon.

All this time the princes of the line of Solomon had been obliged to content themselves with the sovereignty of the province of Xoa or Shoa, without making any attempt to regain their former dignity; but they were unexpectedly restored without bloodshed or disturbance by Naacueto Laeb the grandson of Lalibala above mentioned. This prince, being of a gentle and pacific disposition, was persuaded by a monk named *Tecla Haimanout*, greatly celebrated for his sanctity, to resign the crown, to which, though he received it from his father, he could not pretend any absolute right. In consequence of the mediation of this monk, therefore, it was agreed that Naacueto should give up the empire to Icon Amlac the lineal descendant of Solomon, who then possessed the sovereignty of Shoa. In consequence of this a portion of lands should be irrevocably and irredeemably assigned to him and his heirs; and he should likewise be allowed some marks of sovereignty as a testimony of his former grandeur. In this treaty, however, the good monk did not forget his own interest. He had founded a famous monastery in Shoa, and was primate of the whole empire under the title of *Abuna*. He now insisted that one third of the kingdom of Ethiopia should be absolutely ceded to himself for the maintenance of his own dignity, and the support of the clergy, convents, &c. throughout the country; he also insisted that no native Abyssinian should ever enjoy the same dignity with himself, even though he should have been chosen and ordained at Cairo, as was the custom with the Abyssinian prelates.

Ethiopia.

Uncertain-Icon Amlac raised to the throne of Ethiopia. He did not, however, remove the seat of government from the province of Shoa; but continued at Tegulat the capital of that province during the whole of his life-time, which continued 15 years after his accession to the throne of Ethiopia. We are ignorant of the transactions of his reign, as well as that of several of his successors; five of whom ascended the throne in as many years. From this quick succession Mr Bruce is of opinion, that a civil war had taken place among the candidates for the throne: but the Abyssinian annals make no mention of this; neither have we any particular account of the transactions of the empire till the time of Amda Sion, who began to reign in 1312. He was the son of Wedem Araad, the youngest brother of Icon Amlac, and succeeded to the throne on the death of his father. He professed the Christian religion; but his practice seems to have been very opposite to its precepts. He began his reign with living publicly with a concubine of his father's; and quickly after committed incest with his two sisters. On this he was first exhorted to repentance, and then excommunicated, by Honorius, a monk greatly celebrated for his sanctity, and who has since been canonized. The prince, enraged at this indignity, caused the saint to be severely whipped through every street of his capital. That night the town was by some unknown means set on fire and reduced to ashes: the clergy persuaded the people, that the blood of Honorius had turned to fire as it dropped on the ground, and thus occasioned the catastrophe; but the king suspecting that the monks themselves had been the incendiaries, banished or imprisoned them all, so that their hopes of exciting an insurrection were disappointed; and being dispersed into those provinces where the inhabitants were mostly Jews or Pagan, they were now obliged to apply to what was certainly more incumbent upon them, viz. the diffusion of the knowledge of the gospel.

53

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56

57

While the king was busied with the monks, one of the factors, who had been entrusted with some of his commercial interests, was assassinated by the Moors in the province of Ifat; on which, without making the least complaint or expostulation, he assembled his troops, and with *seven* horsemen (A) fell upon the nearest Mahometan settlements, massacring all he met without metans exception. Putting himself then at the head of his army, he proceeded in the most rapid career of desolation, laying waste the whole country with fire and sword, and carrying off an immense booty.

For some time the Moors were so surprized that they did not think of making opposition; but at last they took up arms, and attempted to surprize the

5 C

Abyssinian

(A) On this Mr Bruce remarks, that "it has been imagined the number should be increased to 70; but there would be little difference in the rashness of the action." The word in the Abyssinian annals which he translates is *seven*; but if we increase the number at all, it ought more probably to be to *seven hundred* than seventy.

Ethiopia.

58 They attack his camp in the night without success.

59 They submit, but quickly revolt again.

60 King of Hadea defeated and taken prisoner.

61 Another rebel chief defeated.

62 The Falasha defeated.

63 The king marches against Adel, Mara, &c.

Abyssinian monarch in his camp, hearing that he had sent out most of his army in detachments. With this view they approached the camp in the night-time, expecting to have found the king and his few soldiers immersed in sleep. Unexpectedly, however, he had been joined by a considerable part of his army, whom he drew up in battle array to receive his enemies. An engagement ensued, in which the king behaved with great valour; killed the Moorish general with his own hand, and gained a complete victory. He then commanded such of his soldiers as could not find houses ready built, to build huts for themselves, and a large tract of land to be plowed and sown, as if he meant to stay in the country of the enemy during the rainy season. The Mahometans now perceiving that they were in danger of being totally exterminated, willingly submitted to the terms he pleased to impose upon them; while the monarch conciliated the affections of his people by dividing among them the vast plunder he had acquired in this expedition.

The Moors no sooner found themselves freed from any apprehensions of immediate danger, than they prepared for a new revolt. The king having intelligence of their designs, secretly prepared to subdue them before they could have time to bring their matters to a sufficient bearing. The Moors, however, being better prepared than he expected, began hostilities by surprising and plundering some villages belonging to the Christians, and destroying their churches. A most formidable combination had taken place; and as the consequence of allowing the confederate rebels to join their forces might have been very dangerous, the king used his utmost endeavours to prevent it. This design was in some measure facilitated by the superstition of Amano king of Hadea, one of the principal rebels. This man, by the advice of a conjurer in whom he put great confidence, instead of marching his troops to the assistance of his allies, remained at home with them, where he was defeated and taken prisoner by a detachment of the king's army. The governor of Amhara was next dispatched against Saber-eddin the revolted governor of Fatigat, with orders to lay waste the country, and use every method to force him to a battle, if he should be disinclined to venture it himself. These orders were punctually executed; Saber-eddin was compelled to stand an engagement, in which he was defeated; the victors plundered his house, and took his wife and children prisoners. But in the mean time intelligence was received of a new revolt among the Falasha, who had assembled a great army, and threatened to become very formidable; their chief keeping a close correspondence with Saber-eddin, as well as with the king of Adel. These, however, shared the same fate with the rest, being entirely defeated by Tzaga Chrisitos another Abyssinian general, who soon after joined the king with his whole army. This proved fatal to the rebel cause: Saber-eddin, no longer able to support himself against the royal forces, was obliged to surrender at discretion, and all the rest were quickly reduced; so that the king was at leisure to march against the kings of Adcl and Mara, who having now united their forces, resolved to give him battle. At this the Abyssinian monarch was so exasperated, that he determined to take a most ample vengeance on his enemies. In the presence of his whole army, there-

fore, and a monk of uncommon sanctity dressed in the same habit in which he usually performed divine service, the king made a long speech against the Mahometans. He recounted the many violences which they had committed; and of which the kings of Adcl and Mara had been principal promoters. He enumerated many examples of murder, sacrilege, &c. of which they had been guilty; setting forth also that they had carried off great numbers of Christians into slavery, and that the view of making slaves was now a great motive with them for making war. He disclaimed every idea of commencing hostilities from any avaricious motive; as a proof of which, he denied that he would accept of any part of the plunder for his own use; concluding with a declaration, that he was now about to swear on the holy eucharist, that, "though but 20 of his army should join him, he would not turn his back upon Adel or Mara, till he had either forced them to tribute, and submission, or entirely extirpated them and annihilated their religion." After this speech, he took the oath in the presence of the whole army; who not only applauded him with loud shouts, but protested that they looked upon themselves to be all bound by the oath he had taken. As he had mentioned in his speech that the plunder had been purchased by the lives of their Christian brethren, they determined to show their abhorrence at keeping any of it on these terms. Taking lighted torches in their hands, therefore, they set fire to the whole plunder that had been amassed since the beginning of the war; and having thus reduced themselves to a state of poverty, they prepared to show their Christianity by thirsting, not after the wealth, but the blood of their enemies.

Notwithstanding the enthusiasm of the whole army on this occasion, the expedition was attended with great difficulties. These arose principally from superstition; and as, on the one hand, the Abyssinians were by this principle laid under considerable disadvantages, their adversaries on the other enjoyed equal advantages from no better cause. The Abyssinians, according to Mr Bruce, are very credulous with respect to genii or spirits which go about doing mischief in the dark. Hence they are afraid of travelling, but especially of fighting, in the night-time; because they imagine that the world is then entirely given up to these beings, who are put out of humour by the motions of men, or of any other terrestrial creature. In the night-time therefore an Abyssinian dares not even throw a little water out of a basin, lest it should fall upon some spirit and provoke it to vengeance. The Moors, on the other hand, though equally fearful, secure themselves against these invisible enemies by means no less ridiculous than the fears themselves. A verse of the Koran, sewed up in leather, and worn round their neck or arm, is sufficient to defy the power of the most mischievous genii. Under such powerful protection, therefore, they laugh at the terrors of the Abyssinians, and are on all occasions ready to attack them in the night-time, and even choose that season rather than any other for coming to an engagement. Sensible of this advantage, and encouraged by the little loss which attended even a defeat in these nocturnal encounters, they determined on the present occasion to avoid any pitched battles, and to content themselves with harassing the king's army, by continual skirmishes of this

Ethiopia.

64 His speech and oath in presence of his army.

65 Enthusiasm of troops.

66 Excessive superstition of both parties.

67 The king's troops harassed by frequent encounters.

Ethiopia.

this kind. Thus, though the Abyssinian monarch had always the advantage, his troops soon began to complain; and, on the commencement of the rainy season, insisted on being allowed to return.—This was by no means agreeable to a prince of such a martial disposition as Amda Sion. He therefore told them, that, if they were afraid of rains, he would conduct them to a country where there were none; meaning Adel, which, though likewise within the limits of the tropical rains, has them at another season than that in which they fall in Abyssinia. Thus he persuaded his army again to set forward: but was so grievously harassed by the nocturnal attacks of the Moors, that he was once more in danger of being deserted; and when by his eloquence he had found means to dissipate the apprehensions of the soldiers, he was seized with such a violent fever as threatened his life. The soldiers now expected that they were soon to return; but while they indulged themselves in the carelessness which usually attends an expectation of this kind, they accidentally received intelligence that the Moors, having assembled an army of 40,000 men, were in full march to attack them, and at a very small distance. The king was now free from fever, but so weak that he fainted on attempting to put himself in readiness for going out to battle. Still, however, his resolution continued firm and unalterable; having recovered from his faint, washed and refreshed himself, he made a speech to his soldiers, filled with the most enthusiastic expressions of confidence in the justice and goodness of the cause in which he was engaged, and in the continuance of the divine favour and protection. “As it never was my opinion (said he), that it was my own strength and valour, or their want of it, which has so often been the cause of preserving me from their hands; so I do not fear at present that my accidental weakness will give them any advantage over me, as long as I trust in God’s power as much as I have ever done.” By this speech the drooping spirits of the Abyssinians were revived; and they only begged that their monarch would now trust to the valour of his troops, and not expose his person to such danger as he had usually done. He promised to comply with their request; but matters were soon thrown into confusion by a report that the Moors had poisoned the wells and enchanted all the running water in the front of the army. The poisoned wells, however, were easily avoided; and a priest of vast sanctity was dispatched a day’s journey before the army to disenchant the waters by his blessings; which, having the advantage of the good qualities of the element itself on their side, were doubtless more powerful than the spells of the infidels. Not content with this, the king caused a river to be consecrated by the name of *Jordan*; but while his men were employed in bathing themselves in this holy water, the *Fis-Awaris*, an officer who had been dispatched with a party of men who always go before the Abyssinian armies, was attacked and driven back on the main body by a detachment of the enemy, who had along with them a number of women provided with drugs to poison and spells to enchant the waters. On this a dreadful panic seized the whole army; who, unmindful of the promises made to their king, not only refused to advance, but for the most part came to the resolution of leaving their camp, and returning homewards without

delay. The king, sensible that all was lost if this pernicious scheme should be adopted, did his utmost to encourage and persuade them to return to their duty; but perceiving that nothing was to be gained by reasoning with men so much terrified, he only requested that such as could not be induced to fight, would not leave their places, but stand quiet spectators of the battle. Even this had very little effect: so that, finding the enemy now ready to make an attack, he ordered his master of the horse, with only five others, to attack the left wing of the enemy; while he, with a small party of his servants, made an attack on the right. This desperate action was attended with success. The king, notwithstanding the weakness he yet laboured under, killed with his own hand two of the commanding officers of the enemy’s right wing; while his son dispatched another of considerable rank belonging to the left. This had such an effect upon the whole Moorish army, that they began evidently to lose courage; while the Abyssinians, ashamed of their conduct, now rushed furiously on to rescue their prince from danger. The battle continued for some time with great obstinacy; but at last the centre and left wing of the Moors were entirely defeated. The right wing, composed principally of Arabians, retired in a body; but, not knowing the country, they entered a deep valley surrounded by perpendicular rocks entirely covered with wood. The Abyssinians, imagining they had nothing more to do, began to strip and mangle the bodies of the killed and wounded; but the king, perceiving that the Arabians had brought themselves into a situation from whence they never could be extricated, obliged his soldiers to desist from this barbarous employment, and even killed two of them who disobeyed his orders. The army was then divided into two parts, one of which surrounded the devoted Arabians, while the other was sent a day’s journey after the remainder of the Moors. Both parties proved equally successful. The king with part of his division attacked the Arabians in front, while the rest rolled great stones down from the tops of the rocks upon them. By this they were thrown into such confusion, that being neither able to fly nor resist, they were all killed to a man. The fate of the Moors was little better. The other division of the Abyssinian army found them lying round a large pool of water which they lapped like as many dogs. In this helpless situation there was nothing requisite but to order them to be slaughtered; and this cruel order was executed with the utmost precision. The soldiers, imagining they should now discharge their vow to heaven, wearied themselves with slaughter; till at last, being almost fatiated with blood, they made a few prisoners, among whom was Saleh king of Mara with his queen; the former of whom was hanged by order of Amda Sion, and the latter cut in pieces and her body given to the dogs by the soldiers.

This signal victory was gained in the end of July 1316; but as the rains at that season set in with violence, most of the army now again insisted on their returning home without delay. The king and principal officers, however, were of opinion, that the advantages so dearly purchased ought by all means to be pursued till they had either reduced the Mahometans to subjection, or at least deprived them of all power to make attacks on the empire with any prospect of success. This

Ethiopia.

He begins the fight with a very few attendants.

The Moors deserted,

and almost entirely cut off.

purifies his advantage,

68 He is seized with a dangerous fever.

69 His troops disheartened.

70 They are seized with a panic, and refuse to engage.

Ethiopia.

opinion being adopted, the king sent back the baggage, women, and others who could be of no use to the army; retaining only the veteran soldiers, who were able to encounter more than six times the number of such enemies as he could expect to meet with. Advancing farther into the Mahometan territories, he took up his residence in a large town called *Zeyla*; from whence he, that very night, sent out a detachment to surprize a large village in the neighbourhood named *Taraca*. This was executed with success; the men were massacred, and the women kept to supply the places of those who had been sent away. Continuing still to advance, he detached parties to lay waste the countries all round; and in this expedition he had the good fortune to cut off two of the principal authors of the conspiracy against him. He then proceeded to invade *Talab* and *Abalé* in the territories of the king of *Adel*. That monarch, now rendered desperate by the view of approaching ruin, had assembled all the troops he could raise, in order to make one last effort against the enemy; but conducted himself with much less prudence than he ought to have done when contending with such an experienced and vigilant adversary. *Amda Sion*, confident of success, took no less care how to prevent the enemy from escaping than how to gain the victory. For this purpose he dispatched parties of horse to lie in wait in all those avenues by which he supposed that the Moors might attempt to make their escape; after which, falling furiously on the *Adelians* himself, and being well supported by his troops, he gained a complete victory; the king of *Adel*, with great numbers of his men, being killed on the spot, and almost all the rest by the parties of horse whom the *Abyssinian* monarch had posted in ambush to intercept them.

As the loss of this battle rendered the affairs of the *Adelians* quite desperate, the three young princes, sons to the late king, with their uncle, waited upon *Amda Sion* with rich presents, which they laid at his feet in the most humble manner, putting their foreheads in the dust, and intreating his pardon; professing their subjection and readiness to obey his commands, provided that he would spare the remainder of their country and property. To this the king made a very unfavourable reply, reproaching them with indignities done to himself; but especially with the sacrifice they had committed in burning churches and murdering priests, destroying also defenceless people in villages, merely because they imagined that he would not protect them. To punish these and other crimes, he said, he was now in the heart of their country; and he was determined never to turn his back upon *Adel* while he had ten men capable of drawing their swords; for which reason he commanded them to return and expect the approach of his army.

By this fierce speech the brother and two eldest children of the king of *Adel* were so disheartened, that they could not speak; but the youngest son made a very spirited speech, in which he attempted to soften the king by complimenting his valour, and showing that it was unworthy of his character to push the war against a people who were already conquered and defenceless. All the answer he could obtain, however, was, that unless the queen with the rest of the royal family, and the principal people of the nation, would come by to-morrow evening and surrender themselves

as the princes had done, he would lay waste the territory of *Adel*, from the place where he sat to the Indian ocean. On this the princes earnestly requested their mother to submit without reserve to the clemency of the *Abyssinian* monarch, and to wait upon him next morning; but she was prevented from this by some of the nobility who had formerly advised the war, and who justly suspected danger to themselves if they should be obliged to submit unconditionally to the conqueror. They resolved, therefore, to venture a battle once more; and the better to ensure success, they bound themselves by an oath to stand by each other to the last extremity. At the same time they dispatched messengers to the princes, requesting them to make their escape with all manner of expedition, and to head the army themselves; all of whom were determined to conquer or die as soon as the royal family should be out of the enemy's hands. By this conduct the *Abyssinian* monarch was so much irritated, that he divided his army into three parts; two of which he commanded to enter the territory of the enemy by different routes, and to exterminate both man and beast wherever they came; while he himself, with the third, took the straight road to the place where the new *Adelian* army was encamped. Here he found a number of infantry drawn up and ready to engage him; but, besides these, there was a multitude of old men, women, and even children, all armed with such weapons as they could procure. Surprised at this sight, he ordered a party of horse to disperse them; but this was found impossible; so that he was obliged to call in the detachments he had sent out, with orders to fall upon the enemy by the nearest way they could advance. The engagement was for a long time very doubtful; and in opposition to *Amda Sion* appeared the young king of *Wypo*, who every where encouraged his troops, and made the most obstinate resistance. The *Abyssinian* monarch having observed him, sheathed his sword, and arming himself with a bow, chose the broadest arrow he could find, and took for just an aim, that he shot the young prince through the side of the neck, and his head inclining to one shoulder he soon fell down dead. On this the spirit of the *Adelians* entirely forsook them, and they betook themselves to flight; but unluckily falling in with two *Abyssinian* detachments coming to the king's relief, they were so completely destroyed, that only three of them are said to have made their escape. On the side of the *Abyssinians*, the Moors, however, the victory was dearly purchased; many of the principal officers being killed, and scarcely one of the cavalry escaping without a wound.

The remainder of this expedition consisted only in the destruction and burning of towns and villages, and massacres of helpless people, on pretence of retaliating the injuries committed by the Mahometans against the Christians. At last, weary of conquest and of carnage, this victorious monarch, who never suffered a defeat in any battle, returned in triumph to his capital, where he ended his days after a reign of 30 years. In his royal time we find that the royal family were not confined as had been the usual practice from the time of the queen of *Sheba* to the massacre by *Judith*; for *Sailey*, *Araad*, the son and successor of *Amda Sion*, distinguished himself in one of the battles in which his father was engaged.

Though the new prince, as appears from what has

Ethiopia.

80
The war continues.

81
An obstinate battle.

82
The Moorish army entirely cut off.

83
Dreadful devastation.

84
The royal family not confined as formerly.

75
His further conquests.

76
Adel invaded.

77
The king of Adel defeated and killed.

78
The princes of Adel submitted.

79
Are unfavourably received.

⁸⁵ **Ethiopia** been just now observed, was by no means destitute of military talents, the Abyssinian empire enjoyed a profound peace during his reign. The only remarkable transaction was the relief given by him to the Coptic patriarch, whom the sultan of Egypt had thrown into prison. At this time a great trade was carried on through the desert by caravans between Cairo and Abyssinia, as well as from Cairo and Suakem on the Red Sea; but the Ethiopic monarch having seized the merchants from Cairo, and sent parties of horse to interrupt the caravans in their passage, the sultan was soon content to release the patriarch, whom he had imprisoned only with a view to extort money.

⁸⁶ **Of Theodorus.** In the reign of Theodorus, who held the crown of Ethiopia from the year 1409 to 1412, we find an infringement made on the treaty between Icon Amlac and the Abuna Tecla-Haimanout formerly mentioned. By that treaty the Abuna was to have a full third of the whole empire for the support of his own dignity and that of the church: but Theodorus, justly considering this as an unreasonable acquisition, reduced it very considerably, though he still allowed a very ample revenue out of every province of the empire; and even this has been confidered by several of his successors as far too large, and has consequently been frequently abridged by them. The annals of this prince's reign are very defective, and Mr Bruce supposes that they have been mutilated by the ecclesiastics; which, considering what we have just now related of his reducing their revenues, is by no means improbable. By his subjects he was considered as such a faint, that to this day the people believe he is to rise again and to reign a thousand years in Abyssinia; during which period war is to cease, and happiness to be universally diffused.

⁸⁸ **Zara Jacob said to equal Solomon.** From the time of Theodorus to that of Zara Jacob, who began his reign in 1434, the Abyssinian annals furnish us with little or nothing of any consequence. The character of this prince is represented as by no means inferior to that of Theodorus, or indeed of any monarch that ever sat on the throne of Ethiopia, or any other kingdom in the world. He is in short set forth as another Solomon, and a model of what sovereigns ought to be; though, from some particulars of his reign, this character should seem to be rather exaggerated. The first remarkable transaction of this great monarch was his sending an embassy to the council of Florence.

⁸⁹ **Sends an embassy to the council of Florence.** The ambassadors were certain priests from Jerusalem, who in that assembly adhered to the opinions of the Greek church; and the embassy itself was judged to be of such consequence as to be the subject of a picture in the Vatican. This prince obtained also a convent at Rome from the pope for the use of the Abyssinians; which is still preserved, though very seldom visited by those for whom it was designed. He seems to have been very desirous of keeping up a correspondence with the Europeans as well as the Asiatics; and in his time we first read of a dispute in Abyssinia with the Frangi or Franks on the subject of religion. This was carried on in presence of the king between one Abta George and a Venetian painter, Francisco de Branco Loe, in which the former confuted and even convinced his antagonist; but from this time we find a party formed for the church of Rome, and which probably took its rise from the embassy to the council of Florence.

⁹⁰ **A party for the church of Rome formed.** The prince of whom we now treat was the first who

⁹¹ **Ethiopia.** introduced persecution on a religious account into his dominions; and for this reason most probably he is so highly commended by the ecclesiastics. The state of religion in Abyssinia was now indeed very corrupt. The Greek profession had been originally established from the church of Alexandria; but in the low provinces bordering on the coast of Adal, the Mahometan superstition prevailed. Many of that persuasion had also dispersed themselves through the towns and villages in the internal parts of the empire, while in not a few places the grossest idolatry still took place; such as the worship of the heavenly bodies, the wind, trees, cows, serpents, &c. All this had hitherto passed unnoticed; but in the reign of Zara Jacob, some families being accused of worshipping the cow and serpent, were brought before the king, who pronounced sentence of death upon them. Their execution was followed by a royal proclamation, that whoever did not carry on his right hand an amulet with these words upon it, "I renounce the devil for Christ our Lord," should not only forfeit his personal estate, but be liable to corporal punishment. The spirit of persecution thus begun, quickly diffused itself, and an inquisitor was appointed to search for criminals. This was one Amda Sion, the king's chief confidant, who pretended to all that absurd and austere devotion common to religious hypocrites. In this he was flattered with uncommon parade and attendance, the usual rewards of people of that stamp; as he never appeared abroad but with a great number of soldiers, trumpets, drums, and other ensigns of military dignity waiting upon him. He kept also a number of spies, who brought him intelligence of those who were secretly guilty of any idolatrous or treasonable practices; after which, proceeding with his attendants to the house of the delinquent, he caused the family first supply himself and his party with refreshments, and then ordered the unhappy wretches to be all put to death in his presence. Among those who suffered in this barbarous manner were the two sons-in-law of the king himself, who had been accused by their wives, the one of adultery, and the other of incest; on which slight ground they were both put to death in their own houses in such a manner as deservedly threw an odium on the king. His conduct was afterwards so severely condemned by certain clergymen from Jerusalem, that a reformation seems to have been produced; and no mention is afterwards made of the inquisitor or persecution during this reign.

⁹² **Amda Sion** The attention of the king was now called off from religion to the state of his affairs in the different provinces of the kingdom. As the Moorish provinces were very rich, by reason of the extensive trade they carried on, and frequently employed their wealth in exciting rebellions, it became necessary that the sovereign himself should examine into the circumstances and dispositions of the several governors; which was likewise proper on another account, that he might assign to each the sum to be paid. On this occasion he divided the empire more distinctly, and increased the number of governments considerably; which being done, he set about repairing the churches throughout the country, which had fallen into decay, or been destroyed in the war with the Mahometans. So zealous was he in this respect, that having heard of the destruction.

⁹¹ **Ethiopia.** Religious persecution introduced.

⁹² **Amda Sion** Murder of the king's sons in-law.

⁹³ **Amda Sion** Murder of the king's sons in-law.

⁹⁴ **Amda Sion** Persecution suppressed.

⁹⁵ **Amda Sion** Affairs of the kingdom regulated.

⁹⁶ **Amda Sion** Churches repaired.

Ethiopia.

struction of the church of the Virgin in Alexandria by fire, he instantly built another in Ethiopia, to repair the loss which Christianity might have suffered.

The last public transaction of this prince's reign was the quashing of a rebellion which some of his governors had entered into; but whatever glory he might acquire from this or any other exploit, his behaviour with regard to his domestic affairs must certainly place him in a very disadvantageous light. In the decline of the king's life, the mother of the heir apparent conceived such an extreme desire to behold her son in possession of the throne, that she began to form schemes for obliging his father to take him into partnership with him in the government. These being discovered, her husband cruelly caused her to be whipped to death: and finding that his son afterwards performed certain solemnities at her grave in token of regard for her, he caused him to be loaded with irons and banished to the top of a mountain; where he would probably have been put to death, had not the monks interfered. These having invented prophecies, dreams, and revelations, that none but the young prince Bæda Mariam was to possess the throne, the old king submitted to the decrees of heaven, and relaxed in his severity.

98
The royal family again confined.

On the accession of the new king in 1468, the old law for imprisoning all the royal family was revived, and a mountain named *Gessen* chosen for the purpose. Having thus secured himself from any danger of a rival in case he should undertake a foreign expedition, he proclaimed a pardon to all those who had been banished during the former reign, and thus ingratiated himself with his people; after which he began to prepare for war. At this the neighbouring princes, particularly the king of Adel, being alarmed, sent ambassadors requesting the continuance of peace. The Abyssinian monarch told them, that his design was to destroy the Dobas; a race of Shepherds very wealthy, but extremely barbarous, professing the pagan religion, and greatly resembling the Gallas. The reason of his commencing hostilities against them was, that they made continual inroads into his country, and committed the greatest cruelties; on which account he determined not to make war as with a common enemy, but to exterminate and destroy them as a nuisance. The king of Adel was no sooner possessed of this piece of intelligence, than he communicated it to the Dobas; desiring them to send their women and children, with their most valuable effects, into his country, till the invasion should be over. This proposal was readily embraced; but Bæda having got notice of it, seized an avenue through which they must necessarily pass, and massacred every one of the company. After this, entering their country, he committed such devastations, that they were glad to submit, and even to renounce their religion in order to free themselves from such a dreadful enemy. The king then turned his arms against Adel, where he was attended with the usual success; a most complete victory being gained over the Moors by the Abyssinian general: but while the king himself was advancing towards that country, with a full resolution to reduce it to the most abject state of misery, he was seized with a pain in his bowels, which occasioned his death.

The discovery of the kingdom of Ethiopia or Abyssinia by the Europeans took place about this time. It

has already been observed, that some intercourse by means of individuals had been carried on betwixt this country and Italy; but the knowledge conveyed to Europeans in this manner was so imperfect and obscure, that it scarce amounted to any thing. Even the situation of the country had been forgot; and though some confused notions were entertained of a distant Christian prince who was likewise a priest, Marco Paulo, the famous Venetian traveller, affirms, that he had met with him in Tartary; and it was universally agreed that his name was *Joannes Prestbyter, Prete Janni*, or *Prefter John*. When the Portuguese began to extend their discoveries along the coast of Africa, more certain intelligence concerning this prince was obtained. Bemoy, one of the kings of the Solfes, a nation on the western coast of Africa, had assured the Portuguese navigators of the existence of such a prince so strongly, that the king determined to send ambassadors to him; and the discovery was of the greater consequence, that a passage to the East Indies was now attempted both by land and sea. The ambassadors were named *Peter Covilan* and *Alphonso de Paiva*. These were sent to Alexandria in Egypt, from whence they were to set out on their journey; the intent of which was, to explore the sources of the Indian trade, the principal markets for the spice, &c. but above all, to discover whether it was possible to arrive at the East Indies by sailing round the continent of Africa.

Ethiopia.
102
Discovery of Ethiopia by the Europeans.
103
Of Prester John.

104
Ambassadors sent from the king of Portugal.

105
Account of their travels.

In the prosecution of this scheme our two travellers went from Alexandria to Cairo; from thence to Suez at the bottom of the Red Sea; from Suez they took their route to Aden, a wealthy and commercial city beyond the Straits of Babel Mandel. Covilan now set sail for India, and De Paiva for Suakem. The latter lost his life without making any discovery; but Covilan passed over to Calicut and Goa. From thence he returned to the continent of Africa, visiting the gold mines of Sofala, and passing from thence to Aden and Cairo; at which last place he was informed of the death of his companion. In this city he was met by two Jews with letters from the king of Abyssinia. One of these Jews was sent back with letters to the Abyssinian monarch; but with the other he proceeded to the island of Ormus in the Persian gulf. Here they separated; the Jew returning home, and Covilan repassing the Straits of Babel Mandel, whence he proceeded to Aden, and afterwards entered the Abyssinian dominions.

The reigning prince at this time was named *Alexander*; and when Covilan arrived, he was employed in levying contributions upon his rebellious subjects. He met with a kind reception; and was conveyed to the capital, where he was promoted to the highest posts of honour, but never allowed to return to Europe again. The intelligence, however, which he transmitted to the court of Portugal proved of much importance. He not only described all the ports of India he had seen, with the situation and wealth of Sofala, but advised the king to prosecute the discovery of the passage round Africa with the utmost diligence; affirming, that the Cape at the southern extremity of the continent was well known in India; and accompanying the whole with a chart which he had obtained from a Moor, and which showed exactly the situation of the Cape and neighbouring countries.

106
Important intelligence conveyed to Portugal by Covilan.

Covilan

97
The queen put to a cruel death.

99
War with the Dobas resolved on.

100
They are massacred.

101
Death of the king.

Ethiopia. Covillan arrived in Ethiopia about the year 1490; and the prince to whom he addressed himself was Alexander the son of Bæda Mariam. He seems to have been endowed with many good qualities, and no less versed in military affairs than any of his predecessors. His reign was disturbed by plots and rebellions, which at last proved fatal to him. From his early years he manifested a great desire to make war on the king of Adel, who seems to have been the natural rival of the Ethiopian princes. But the Adelian monarch, having now become sensible that he was not able to cope with such powerful adversaries, took the most effectual way of securing himself; viz. by gaining over a party at the court of Abyssinia. In this he had now succeeded so well, that when Alexander was about to invade Adel, Za Saluce the prime minister, with many of the principal nobility, were in the interest of his adversary.

Not being apprized of this treachery, however, Alexander entrusted this minister with the command of a great part of his forces; and with these the latter abandoned him in the heat of an engagement. Alexander and the few troops who remained with him, however, were so far from being disheartened by this treachery, that they seemed to be inspired with fresh courage. The king having killed the standard-bearer of the enemy, and thus become master of the green ensign of Mahomet, the enemy began to give way; and on his killing the king of Adel's son, immediately after they quitted the field altogether. The victory was not by any means complete; neither was Alexander in a situation to pursue the advantage he had gained. Having therefore challenged the Moors to a second engagement, which they declined, he returned with a design to punish his perfidious minister Za Saluce, who had endeavoured to excite the governors of all the provinces to revolt as he went along. The traitor, however, had laid his plots too well; so that his sovereign was murdered in two days after his arrival in the capital. Za Saluce did not enjoy the rewards he expected from his treachery: for having attempted to excite a revolt in the province of Amhara, he was attacked by the nobility there; and his troops deserting him, he was taken prisoner without any resistance, his eyes were put out, and himself exposed on an ass, to the curses and derision of the people.

Alexander was succeeded by an infant son, who reigned only seven months; after which his younger brother Naod was chosen king by the unanimous voice of the people. He proved a wife and virtuous prince; but the late misfortunes, together with the corruption introduced at court by the Mahometans, had so unhinged the government, that it became very difficult to know how to manage matters. Judging very properly, however, that one of the most effectual methods of quieting the minds of the people would be an offer of a general pardon; he not only proclaimed this, but likewise, "That any person who should upbraid another with being a party in the misfortunes of past times, or say that he had been privy to this or that conspiracy, had received bribes from the Moors, &c. should be put to death without delay." On his entering upon government, he found it necessary to prepare against an enemy whom we have not heretofore mentioned, viz. Maffudi, prince of a district named *Arar*, which lay in the neighbourhood of Adel. This chief-

tain being a man of a very enterprising and martial disposition, and a most violent enthusiast in the Mahometan cause, had made a vow to spend 40 days annually in some part of the Abyssinian dominions during the time of Lent. For this purpose he kept a small body of veteran troops, with whom he fell sometimes on one part, and sometimes on another of the frontiers of Ethiopia, putting to death without mercy such as made resistance, and carrying off for slaves those who made none. For 30 years he continued this practice; beginning exactly on the first day of Lent, and proceeding gradually up the country as the term advanced. His progress was greatly facilitated by the superstition of the people themselves, who kept that fast with such rigour as almost entirely to exhaust their strength; so that Maffudi having never met with any opponent, was always sure of success, and thus came to be reckoned invincible. On the present occasion, however, he experienced a prodigious reverse of fortune. Naod having enjoined his soldiers to live in the same full and free manner during the fast as at any other time, and having set the example himself, marched out against his enemy; who being ignorant of the precaution he had taken, advanced with his usual confidence of success. The Abyssinian monarch, still pretending fear, as if on account of the weakness of his men, pitched his camp in very strong ground, but left some passages open to it, that the enemy might make an attack. This was done contrary to the advice of their leader; and the consequence was, that almost every one of them was cut off. On this the king of Adel sent ambassadors to solicit a continuance of the peace with himself; which was granted, upon condition that he restored all the slaves whom Maffudi had carried off in his last year's expedition; with which the Mahometan chief thought proper to comply rather than engage in such a dangerous war.

Naod having thus freed his country from the danger of any foreign invasion, applied himself to the cultivation of the arts of peace, and reforming the manners of his subjects, in which he spent the remainder of his days. He died in 1508, after a reign of 13 years; and was succeeded by his son David III. a child of 11 years of age. Though the affairs of the empire were at present in such a state as required a very prudent and active administration, the Empress Helena, widow of Bæda Mariam, had interest enough to get the crown settled on the infant just mentioned. This proceeded partly from her desire of engrossing all the power into her own hands, and partly from a wish to keep peace with Adel her native country. These ends could not be accomplished but by keeping a minor on the throne of Abyssinia; which was therefore her constant object as long as she lived. But though this might not have been attended with any very bad consequence had the two nations been left to decide the quarrel by themselves, the face of affairs was now quite changed by the interference of the Turks. That people having now conquered almost the whole of Arabia to the Indian ocean, being likewise on the point of reducing Egypt, and having a great advantage over their adversaries in using fire-arms, now projected the conquest of India also. In this indeed they were always disappointed by the fa-

Ethiopia.

He is defeated.

David III.

Abyssinia in danger from the Turks.

Ethiopia.

perior valour of the Portuguese; but as this conquest remained a favourite object with them, they did not abandon their attempts. All along the countries which they had conquered, they exacted such enormous contributions from the merchants, that vast numbers of them fled to the African side of the Red Sea, and settled on the coast of Adel. The Turks, surpris'd at the increase of trade in this country, which they themselves had occasioned, resolv'd to share in the profits. For this purpose they took possession of Zeyla, a small island in the Red Sea, directly opposite to the coast of Adel; and erected a custom-house in it, where they oppress'd and ruin'd the trade as in other places. Thus both Adel and Abyssinia were threaten'd with a most formidable enemy, which it would have been utterly out of their power to have resisted, had not the desire of possessing India constantly prevented the Turks from directing their strength against these countries. Helena was sensible enough of the dangerous situation of the empire, but preferred the gratification of her ambition to the good of her country; however, that she might preserve herself from the attacks of such a formidable enemy, it was now thought proper to enter into an alliance with the Portuguese. The ambassador from Portugal Peter Covillan, was deny'd the liberty of returning to his own country, as has been already related; and as, for some time past, it had not been obvious how he could be of much use, he had begun to fall into oblivion. The present emergency, however, recover'd his importance. The empress was sensible of the necessity she lay under of having some person who understood both the Abyssinian and Portuguese languages before she could open any correspondence with that nation, and who might likewise inform her of the names of the persons to whom her letters ought to be address'd. By him she was now instructed in every thing necessary to the success of her embassy. The message was committed to one Matthew an Armenian merchant, with whom a young Abyssinian was join'd; but the latter died by the way. The letters they carry'd are by Mr Bruce suppos'd to have been partly the work of Covillan and partly of the less experienced Abyssinian confidants of the empress. They began with telling the king, that Matthew would give him information of her whole purpose, and that he might depend on the truth of what he said; but in the latter part the whole secret of the embassy was discover'd, and a force sufficient to destroy the Turkish power was expressly solicit'd. Among the other particulars of this embassy also it is said, that a third part of Abyssinia was offer'd in case her requisitions were comply'd with; but this, as well as the embassy itself, was always deny'd by David when he came of age.

116
An embassy
sent to Por-
tugal.

117
The ambas-
sador ill
used.

Matthew, tho' rais'd from the rank of merchant to that of an ambassador, could not, it seems, act according to his new dignity in such a manner as to screen himself from the most mortifying and dangerous imputations. Having arriv'd at Dabul in the East Indies, he was seiz'd as a spy, but reliev'd by Albuquerque the viceroy of Goa; and that not out of any regard to his character as ambassador, but because he himself had a design upon Abyssinia. This viceroy us'd his utmost endeavours to induce Matthew to deliver his commissions to him; but the ambassador constantly refus'd to show any letter he had, except to the king of Portugal

N^o 119.

in person, and in his own kingdom. This put him out of favour with the viceroy; while his attendants, displeas'd at the mean appearance of the man, insulted sometimes that he was a spy from the sultan, at others that he was a cook, an impostor, or a menial servant. Matthew, however, perceiving that he was now out of danger, maintain'd that his person was sacred, and insisted on being treated as the representative of a sovereign. He let the viceroy, bishop, and clergy know, that he had with him a piece of the wood of the true cross, sent as a present to the king of Portugal; and he required them, under pain of sacrifice, to pay respect to the bearer of such a precious relic, and to celebrate its arrival as a festival. This was instantly comply'd with, and a solemn procession instituted; but very little regard appears to have been paid to this ambassador either in his temporal or spiritual character, as he could not obtain leave to depart for Portugal till 1513, which was three years after he arriv'd in India. In his passage he was extremely ill-treated by the shipmasters with whom he fail'd: but of this they soon had cause to repent; as on their arrival at Lisbon they were all put in irons, and would probably have died in confinement, had not Matthew made intercession for them with the king.

In the mean time, Maffudi having recover'd from the defeat given him by Naod, and form'd alliances with the Turks in Arabia, had renew'd his depredations on the Abyssinian territories with more success than ever. Such a number of slaves had been, by his assiduity, sent to Mecca, that he was honour'd with a green silk standard (an emblem of the true Mahometan faith), with a tent of black velvet embroidered with gold, and he was likewise made Sheykh of Zeyla; so that, as this island was properly the key to the Abyssinian empire, he could neither be reward'd with greater honour nor profit. This happen'd when David had attained the age of 16; and in consequence of such surprising success, the king of Adel, never a hearty friend to Abyssinia, determin'd to break the peace with that empire and make an alliance with Maffudi. Having taken this resolution, the two princes invaded Abyssinia with their joint forces, and in one year carry'd off 19,000 Christian slaves, so that a general terror was spread over the whole empire. David, already impatient of the injuries his people had sustain'd, determin'd to raise an army, and to head it in person as his ancestors had done, contrary to the advice of the empress, who, considering only his youth and inexperience in military affairs, wish'd him to have employ'd some of his veteran officers. A very powerful army was rais'd, and ample supplies of all kinds were procur'd. With one part of his forces the emperor took the road to Aussia the capital of Adel; sending the other under the command of an officer named *Betwudet*, to meet the Moorish army, who were then ravaging part of Abyssinia. It was natural to be imagin'd, that the Moors, on hearing that an army was marching to destroy the capital of their country, would abandon the thoughts of conquest or plunder to preserve it. In doing this, David knew that they had certain desires to pass before they could reach Adel. He order'd Betwudet therefore to allow them to enter these desiles; and before they could get through, he himself with the main body of the army, march'd to attack them

Ethiopia.

118

Maffudi re-
new'd his
depreda-
tions with
more suc-
cess than
ever.

119

David
marches a-
gainst him.

110
affudi
ophesies
own
ach.

them at the other end. Thus the Moors were completely hemmed in by a superior army; but besides this unfavourable situation, they were farther dispirited by Mafudi. That hero came, on the morning of the engagement, to the king of Adel, informing him that his own time was now come; that he had been certainly told by a prophet, long ago, that if this year (1516) he should fight the king of Abyssinia in person, he should lose his life. He was assured that the Abyssinian monarch was then present, having seen the scarlet tent which was used only by the sovereigns of that country; and therefore advised the king of Adel to make the best of his way over the least steep part of the mountain before the engagement began. The Adelian monarch, who had at any rate no great inclination to fight, was not inspired with courage by this speech: he therefore followed the advice given him; and, with a few of his friends, passed the mountain, leaving his troops to their fate. The Moors, in the mean time, being abandoned by one leader, and having another devoted to destruction, showed an uncommon backwardness to engage, which was taken notice of by their enemies. Mafudi, however, as soon as he supposed the king of Adel to be out of danger, sent a trumpet to the Abyssinian camp, with a challenge to any man of quality in the army to fight him; on condition that the party of the victorious champion should be accounted conquerors, and that the armies should immediately separate without further bloodshed. The challenge was instantly accepted by a monk named *Gabriel Andreas*; who, in the reign of Bæda Mariam, had been condemned to lose the tip of his tongue for speaking lightly of the king's proclamation of himself. Mafudi showed no reluctance to present himself; but received such a stroke from his antagonist with a two-handed sword as almost cut his body in two, and he immediately fell down dead. Andreas cut off his head; and throwing it at the king's feet, cried out, "There is the Goliath of the infidels." This became the signal for a general engagement, notwithstanding the terms stipulated by Mafudi before the combat. The Moors were quickly repulsed by the king's troops, and driven backward through the defile. At the other end they were met by the *Betwulet* (8), who drove them back to the king's forces; so that at last being forced to fly to the mountains, they were all slaughtered by the peasants or perished with hunger and thirst.

122
The Moors
feared
it de-
stroyed.

123
by the
Portuguese

[123]
ambassy
from the
king of
Portugal.

most applause ; but who by reason of his age, being now 86, was certainly very unfit for such a distant and perilous voyage. He died accordingly on the island of Camaran in the Red Sea, where Suarez had imprudently landed, and passed the winter in the utmost distress for want of provisions of every kind. This admiral was succeeded by Lopez de Seguyera, who sailed first to the island of Goa in the East Indies, where he fitted out a strong fleet ; after which he returned to the Red Sea, and landed on the island of Massiuh, having along with him Matthew, whose authenticity of whose mission there had been such disputes. At his first approach the inhabitants fled ; but at last he was accosted by a Christian and a Moor from the continent, who informed him that the coast opposite to Massiuh was part of the kingdom of Abyssinia, and that it was governed by an officer named *Babarnagash* ; that all the inhabitants of the island were Christians ; and that on reason of their flying at the sight of the Portuguese fleet on the coast of Abyssinia. They made descents, and ravaged the Turks, &c. The admiral dismissed them with presents ; and soon after had a visit from the governor of Arkeeko, a town on the continent ; who informed him, that about 24 miles up the country there was a monastery, seven of the members of which were now deputed to wait upon him. These instantly knew Matthew, and congratulated him in the warmest manner upon his return from such a long voyage. An interview soon took place between the Babarnagash himself and Lopez. The Abyssinian informed him, that the coming of the Portuguese had been long expected, in consequence of certain ancient prophecies ; and that he himself and all the officers of the emperor were ready to serve him. They parted with mutual presents ; and all doubt about Matthew being now removed, he prepared to set out for the emperor's court ; while Roderigo de Lima was nominated ambassador in place of Galvan who died. Along with them were 15 Portuguese ; all men of the most determined courage, and who would hesitate at nothing which they thought might contribute to the glory of their king, their own honour, or the advantage of their country. Their present journey indeed was much more perilous than their voyage from Portugal to Abyssinia. The emperor was at this time in the southern part of his dominions, but the Portuguese had landed on the northern part ; so that they had almost the whole breadth of the empire to pass before they could meet with him. The very first journey they attempted was thro' a wood so thick that it could scarce afford a passage either to man or beast, while the interstices of the trees were so interwoven with briars and thorns of various kinds, that their passage was rendered almost impracticable. This was rendered still more terrible by the vast numbers of wild beasts they saw, and which seemed only to be prevented from devouring them by the appearance of so many men together. The rainy season was also now begun ; so that they were exposed to incessant deluges of water descending from the clouds, besides frequent and violent storms of wind, thunder and lightning, &c. To add to their misfortunes, an epidemic fever broke out among them,

Ethiopia.

124

125

journey of
the ambas-
sadors thro'
Abyssinia,

Ethiopia.

126

Are very indifferently received by the emperor, and long detained.

which carried off Matthew and one of the servants of Don Rodrigo. At last, after a most tedious and toilsome journey, from the 16th of April to the 18th of October 1520, the Portuguese ambassador, with his retinue, came within sight of the Abyssinian camp at the distance of about three miles. His reception was by no means favourable; for instead of being immediately admitted to the presence of the emperor, he was waited on by one of the officers of state, styled, in token of humility, *Hadug Ras*, or *commander of asses*; who caused him pitch his tent three miles farther off from the camp: and it was not till five years afterwards that he was enabled to finish the business of his embassy, and obtained leave to depart for Portugal.

127

At last allowed to depart with an ambassador from the emperor.

128
Bad effects of this delay.

During all this time not a single word had passed relating to the affairs of the two nations; so that it is difficult to imagine what might have been the design of the Abyssinian emperor. At last, having resolved to send an embassy to Portugal, he allowed Rodrigo to depart, but detained two of his people, appointing Zaga Zaab, an Abyssinian monk, his ambassador to Portugal.

129

The emperor defeated by the Moors.

This long intercourse betwixt two such distant nations, however, could not but greatly alarm the Mahometan powers, who were natural enemies to both. Selim the Turkish sultan, having been constantly defeated by the Portuguese in the east, and alarmed at the thoughts of having a fleet of that nation in the Red Sea, where they might greatly annoy his settlements on the coast of Arabia, determined to carry his arms to the African side; while the king of Adel, having strengthened himself by alliances with the Turkish officers in Arabia, was now become a much more formidable enemy than before. This was soon experienced in a battle with the Adeliens; in which the Abyssinian monarch was overthrown with the loss of almost all his great officers and principal nobility, besides a vast number of private men. The victory was principally owing to the assistance given by the Turks; for the army was commanded by Mahomet surnamed *Gragné*, i. e. *left-handed*, governor of Zeyla, which had now received a Turkish garrison. This man, having the conquest of Abyssinia greatly at heart, resolved, as soon as possible, to effect something decisive; and therefore having sent to Mecca all the prisoners taken in his late expedition, he obtained in return a considerable number of janizaries, with a train of portable artillery. Thus the fortune of the war was entirely decided in favour of the Adeliens and Turks; the emperor was defeated in every battle, and frequently hunted from place to place like a wild beast. The Moors, finding at last no necessity for keeping up an army, over-ran the whole empire in small parties, every where plundering and burning the towns and villages, and carrying off the people for slaves.

130

The Adeliens assisted by the Turks.

131
The emperor every where defeated and reduced to great distress.

This destructive war continued till the year 1537; when Gragné sent a message to the emperor, exhorting him not to fight any longer against God, but to make peace while it was in his power, and give him his daughter in marriage: on which condition he would withdraw his army; but otherwise he would reduce his empire to such a state that it should be capable of producing nothing but grass. David, however, still

refused to submit; replying, 'that he put his confidence in God, who at present only chastised him and his people for their sins; but that Gragné himself, being an infidel, and enemy to the true religion, could not fail of coming in a short time to a miserable end. This unsuccessful negotiation was followed by several encounters, in which the emperor was constantly defeated; in one of them his eldest son was killed, and in another his youngest was taken prisoner: so that he now seemed entirely destitute, being obliged to wander on foot, and all alone, hiding himself throughout the day among the bushes on the mountains.

The invincible constancy with which this forlorn monarch bore his misfortunes, proved a matter of surprise both to friends and enemies. Many of his veteran soldiers, compassionating the distresses of their sovereign, sought him out in his hiding places; so that he once more found himself at the head of a small army, with which he gained some advantages that served to keep up his own spirits and those of his adherents. His greatest enemy was Ammer, one of Gragné's officers, who headed the rebellious Abyssinians, and who had formed a scheme of assassinating the king; but, instead of accomplishing his purpose, he himself was assassinated in 1538 by a common soldier, on what account we are not informed.

By the death of Ammer and the small successes which David himself had obtained, the affairs of Abyssinia seemed to revive; but still there was no probability of their being ever brought to a fortunate issue. An embassy to Portugal was therefore thought of in good earnest, as the mischievous effects of slighting the proffered friendship of that power were now sufficiently apparent. One of the attendants of Rodrigo, named John Bermudes, who had been detained in Abyssinia, was chosen for this purpose; and to his temporal character of ambassador was added that of Abuna, primate or patriarch. John, who was not a clergyman originally, had received all the inferior ecclesiastical orders at once, that the supreme one might be thus conferred upon him; but happening to be a great bigot to the popish religion, he would not accept of his new dignity but with a proviso, that his ordination should be approved by the pope. This was indirectly submitting the church of Abyssinia to that of Rome; to which David would never have agreed, had it not been for the desperate situation of his affairs at that time. John was therefore allowed to do as he thought proper: when passing through Arabia and Egypt to Italy, he had his ordination confirmed by the pope; after which he set out on the business of his embassy. On his arrival at Lisbon, he was acknowledged by the king as patriarch of Alexandria, Abyssinia, and of the sea; for this last title had also been conferred upon him by his Holiness. Entering then upon the purpose of his embassy, he began by putting Zaga Zaab in irons for having waited so much time, and done nothing effectual since he had left Abyssinia. Then he represented to the king the distresses of the Abyssinians in such a strong light, and insisted so violently for relief to them, that an order was very soon procured for 400 musketeers to be sent by Don Garcia de Noronha to their relief. To

accelerate the progress of the intended succours, John him-

Ethiopia.

132
Refuses to submit.

133
A new embassy to Portugal.

134
A body of Portuguese ordered to assist the emperor.

Ethiopia

himself proposed to sail in the same fleet with Don Garcia; but his voyage was delayed for a whole year by sickness occasioned, as he supposed, by poison given him by Zaga Zaab, the monk whom he had imprisoned, and who had been set at liberty by the king. After his recovery, however, he set sail for India, where he arrived in safety. The death of Don Garcia, which happened in the mean time, occasioned another delay; but at last it was resolved that Don Stephen de Gama, who had succeeded to Don Garcia, should undertake an expedition to the Red Sea, in order to burn some Turkish galleys which then lay at Suez. But intelligence having in the mean time been received of the intended voyage, these vessels had withdrawn themselves. Anchoring then in the port of Mafuah, Don Stephen sent over to Arkeeko on the continent to procure fresh water and other provisions; but the Turks and Moors being now entirely masters of that coast, the goods he had sent in exchange were seized without any thing being given in return. A message was brought back, importing, that the king of Adel was now master of all Ethiopia, and consequently that no trade could be carried on without his leave; but if Don Stephen would make peace with him, the goods should be restored, a plentiful supply of water and all kinds of provisions granted, and amends likewise made for 60 Portuguese who had been killed at Zeyla. These had run away from the fleet on its first arrival in the Red Sea, and landed on the coast of Adel, where they could procure no water; of which the barbarians took advantage to decoy them up the country; where, having persuaded them to lay down their arms, they murdered them all. To this Don Stephen returned a smooth answer, sent more goods, obtained provisions, and promised to come ashore as soon as a Mahometan festival, which the savages were then celebrating, should be over. This treaty was carried on with equal bad faith on both sides; but Don Stephen had now the advantage by obtaining the provisions he stood in need of. There were no sooner brought on board, than he strictly forbade all intercourse with the land; and choosing out 600 men, he attacked the town of Arkeeko, killed the governor, and sent his head to the Abyssinian court; massacring at the same time all the people in the town he met with.

135
The fleet
arrives
at the
town of
Arkeeko.

136
The
Abyssinians
are
satisfied
with
this
interval.

137
The
Abyssinians
are
satisfied
with
this
interval.

138
The
Abyssinians
are
satisfied
with
this
interval.

During this long interval a considerable change had taken place in the Abyssinian affairs. We have already seen that David had been reduced to great distress; but afterwards met with some little successes, which seemed to indicate an approaching change of fortune. In the case, however, he was soon disappointed. A Mahometan chief called *Vizir Musdid* made an attack upon the rock Geshen, where the royal family were kept; and finding it entirely unguarded, ascended without opposition, and put every person to the sword. This last disaster seems to have been too great for the resolution even of this heroic prince, as he died the same year 1540. He was succeeded by his son Claudius, who, though then but about 18 years of age, was endowed with all the great qualities necessary for managing the affairs of the empire in such a dreadful crisis, and had made considerable progress before the arrival of the Portuguese.

On his accession, the Moors despising his youth, instantly formed a league among themselves to crush him at once; but, like almost all others too confident of victory, they neglected to take the proper precautions against a surprise. This was not unobserved by Claudius; who falling upon one party which lay next to him, gave them a total defeat. The king pursued them the whole day of the engagement, the ensuing night, and part of the following day; putting to death without mercy every one who fell into his hands. This excessive ardour very much damped the spirits of his enemies, and at the same time inspired his own party with the most sanguine hopes of success; whence he soon appeared at the head of such an army as convinced his enemies that he was by no means to be despised. They now found it necessary to desist from the practice they had so long continued of plundering and ravaging the country; to call in their scattered parties, unite their troops, and spend the rainy season in such parts of Abyssinia as they had conquered, without returning into Adel as had hitherto been usual with them. They now came to a resolution to force the king to a general engagement, in which they hoped to prove victorious by dint of numbers. For this purpose all the rebel chiefs in Abyssinia were called in, and a formidable army collected. They waited only for one very experienced chief named *Jonathan*; after whose junction they determined to attack the royal army without delay. But Claudius took his posts at all times with such judgment, that any attempt upon his camp would have been almost desperate; and getting intelligence where Jonathan lay with his forces, he marched out in the night-time, came upon him quite unprepared, defeated and killed him, sending his head to the rest of the confederacy by a prisoner, the only one he had spared out of all those who were taken. By the same messenger a defiance was sent to the Moors, and many opprobrious epithets were bestowed upon them; but though the armies approached one another, and continued for several days under arms, the Moors were so much intimidated that they would by no means venture an engagement.

Ethiopia

139
The
Moors
defeated.

140
The
Moors
defeated.

141
Jonathan, a
rebel chief,
defeated
and killed.

By this victory the spirits of the Abyssinians were so much elevated, that they flocked in from all parts to join their prince; and even many of the Mahometans, having experienced the lenity of the Christian government, chose rather to submit to Claudius than to the Turks and Adalans. The king, however, was in danger of being assassinated by one Ammer, a treacherous governor; who knowing that he had retired to some distance from his army to celebrate the festival of Easter, attempted to surprise him when almost destitute of attendants; but Claudius having timely notice of his designs, laid an ambush for him with a considerable part of his army which he headed in person. The rebel, not being equally well informed, fell into the snare, was defeated, and almost his whole army cut off on the 24th of April 1541.

142
Unsuccessful
attempt
to assassinate
Claudius.

Matters were in this situation when the Portuguese arrived, as has already been related. The head of the governor of Arkeeko had been received by the queen, who considered it as an happy instance of the valour of her allies, and as a presage of future victories. The Portuguese admiral, Don Stephen de Gama, lost no time in employing the men allowed by the king to

¹⁴³ **Ethiopia**, assist the Abyssinians. These were in number 450; but as the officers who commanded them were all noblemen of the first rank, the army was considerably increased by the number of their servants. The supreme command was given to Don Christoplier de Gama the admiral's youngest brother. Almost every man on board, however, was ambitious to share in the glory of this enterprise; whence great complaints were made by those who were not allowed to go: and hence, Mr Bruce informs us, the bay in the island of Masua, where the admiral's galley rode, had the name of *Bahia dos Agravados*; the bay of the injured, not of the sick, as has been erroneously supposed.

¹⁴⁴ **Derivation of the name of a bay in Masuah.** This gallant army instantly set forward by the most easy road through the Abyssinian territories, in order to join the emperor. Still, however, the way was so rugged, that the carriages of their artillery gave way, and they were therefore obliged to construct new ones as they went along, splitting the barrels of old muskets to furnish them with iron, that commodity being very scarce in Abyssinia. In this journey the general was met by the empress, attended by her two sisters and a great many others of both sexes, whom he saluted with drums beating and colours flying, accompanied by a general discharge of the fire-arms, to their great confusion and terror. Her majesty, whose person was entirely covered, indulged the Portuguese general with a view of her face; and after a mutual exchange of civilities, the queen returned with 100 musketeers appointed by him as her guard. After eight days march, through a very rugged country, Don Christoplier received a defiance in very insulting terms from Gragné the Mahometan general, which was returned in the same style. An engagement took place on the 25th of March 1542; in which little was done by either party besides wounding both the commanders; however, Gragné, though greatly superior in horse, had already felt so much of the Portuguese valour, that he did not choose to venture a second battle.

¹⁴⁵ **Interview with the empress.** As the season was now far advanced, the Portuguese put themselves into winter-quarters; while Gragné remained in their neighbourhood, in hopes of forcing them to a battle before they could be joined by the king, who advanced for the purpose as fast as possible. This being the case, it was to the last degree imprudent in Don Christoplier to think of venturing an engagement without previously forming a junction with his royal ally; especially as Gragné had now doubled the number of his horse, increased his train of artillery, and otherwise received considerable reinforcements. Unfortunately, however, the Portuguese general suffered himself to be hurried away by the impetuosity of his own temper; and paying regard to the defiances and reproaches of a barbarian whom he ought to have despised, was induced, contrary to all advice that could be given, to venture an engagement at a vast disadvantage. Yet when the armies encountered each other, the superiority of the Portuguese was so great, that victory seemed likely to be decided in their favour. On this Gragné ordered some artillery to be pointed against the Abyssinian allies. These, entirely unaccustomed to fire-arms, fled almost at the first discharge. Gragné, well knowing that it was his interest to destroy the Portuguese, who were only 400 in number, ordered so pursuit against the Abyssinians, but fell with his

whole force upon the Europeans. Even yet his success was doubtful, till Don Christoplier, exposing himself too much, was singled out and shot through the arm. This produced such confusion, that a total defeat, with the loss of the camp, ensued; when the barbarians, according to custom, put to death all the wounded, and began to abuse the women, who had all retired into the tent of the general. This being observed by a noble Abyssinian lady married to one of the Portuguese, she set fire to some barrels of gunpowder which happened to be in the tent, and thus perished along with her ravishers.

Don Christoplier, who by his rashness had occasioned this disaster, obstinately refused to fly, till he was put into a litter by force, and sent off along with the queen and patriarch, who happened to be present. The two latter had set off before the battle; but Don Christoplier sent some horsemen in pursuit of them, by whom they were brought back, and reproached by the general for the bad example they had shown to the army. Arriving at the approach of night in a wood where there was a cave, Don Christoplier entered it, to have his wound dressed, but obstinately refused to proceed farther. Next day he was taken; betrayed, as is most probable, by a woman whom he loved; who is said to have pointed out this cave to him, and promised to send some friends to convey him into a place of safety. Instead of this, a party of the enemy entered the cave; and on his readily informing them of his name, they instantly carried him in triumph to Gragné. Here, after several insults had passed on both sides, the barbarian, in a fit of passion, cut off his head; which was sent to Constantinople, and his body cut in pieces and dispersed through Abyssinia.

This cruelty of Gragné proved more detrimental to his cause than a complete victory gained by the other party could have been. On the one hand, the Portuguese were so exasperated by the loss of their leader, that they were ready to embark in the most desperate undertakings, in order to revenge his death; on the other, the Turks, on whom he principally depended, were irritated to the last degree at the disappointment of sharing his ransom, which they imagined would have been an immense sum; and therefore abandoned their leader to return to their own country. Gragné, thus left to decide the quarrel with his Africans, was quickly defeated by Claudius; and in another engagement which took place on the 10th of February 1543, his troops were defeated and himself killed. This last misfortune was owing to his boldness in advancing before his army which was giving way, so that he became known to the Portuguese. On this he was singled out by a Portuguese named *Peter Lyon*, who had been valet de chambre to Don Christoplier. This man, to make his aim more sure, crept for a considerable way along the bank of a river towards the place where Gragné was; and when come sufficiently near, shot him quite through the body. Finding himself mortally wounded, he quitted the field of battle; and was followed by Lyon, who in a short time saw him fall from his horse. He then came up to him, and cut off one of his ears, which he put in his pocket, and returned to the battle to do what further service he could. The next day Gragné's body was found by an Abyssinian officer, who cut off his head and claimed the merit of killing him; but Lyon having pulled

¹⁴⁶ **Battle between the Portuguese and the Moors.**

¹⁴⁷ **Don Christoplier rashly engages at a disadvantage.**

¹⁴⁸ **Ethiopia** Is wounded and defeated.

¹⁴⁹ **Takes shelter in a cave, is taken and put to death.**

¹⁵⁰ **Gragné is banished by his allies, is defeated and killed.**

Ethiopia.

151
Toram a rebel chief defeated and killed.

out the ear which he carried in his pocket, vindicated his own right to the reward which was to be given to the other. On this occasion the Moorish army was almost entirely destroyed; Gragné's wife and son were taken prisoners, with Nur the son of Mugdi, who destroyed the royal family; and it had been happy for Claudius, as we shall afterwards see, that he had put these prisoners to death. Very soon after this engagement, the emperor had intelligence that Joram, a rebel chief, who had once reduced his father David to great distress, was advancing rapidly in hopes of being still able to be present at the battle. This was the last of his father's enemies on whom Claudius had to revenge himself; and this was effectually done by a detachment of his army, who posted themselves in his way, fell upon him unexpectedly, and cut him in pieces with all his men.

152
Disturbances on affairs of religion.

Claudius being now freed from all apprehension of foreign enemies, began to turn his thoughts towards the reparation of the damages occasioned by such a long war, and the settlement of religious affairs. We have already mentioned, that John Bermudes was appointed by the pope, as he said, patriarch of Alexandria, Abyssinia, and of the sea. This, however, is said by others to have been a falsehood; that John was originally ordained by the old patriarch of Abyssinia; and that the pope did no more than give his sanction to this ordination, without adding any new one of his own. But whether this was so or not, certain it is, that John, who was very insolent in his behaviour, and of a turbulent disposition, now began to insist that Claudius should not only embrace the doctrines of the church of Rome, but establish that religion throughout the empire, which he said his father David had engaged to do; and which, considering the extreme distress in which he was involved, it is very probable that he did. Claudius, however, was of a different opinion, and refused to alter the religion of the country; upon which a contention began, which was not ended but by the total expulsion of the catholics, and the cutting off all communication with Europeans. At that time the Portuguese and Abyssinians intermarried, and attended religious worship promiscuously in each others churches: so that the two nations might have continued to live in harmony, had it not been for the misbehaviour of Bermudes. Claudius, perceiving the violence and overbearing disposition of the man, took every opportunity of showing his attachment to the Alexandrian or Greek church; denying that he had made any promise of submitting to the see of Rome. On this Bermudes told him that he was accursed and excommunicated; the king in return called him a Nestorian heretic; to which Bermudes replied by calling him a liar, and threatened to return to India, and carry all the Portuguese along with him. To this insolent speech Claudius answered, that he wished indeed that Bermudes would return to India; but that he would not allow the Portuguese, nor any person, to leave his territories without permission.

153
Altercation betwixt the emperor and the patriarch Bermudes.

Thus matters seemed likely to come to an open rupture; and there can be no doubt that the worst extremities would have followed, had not the emperor been restrained by the fear of the Portuguese valour on the one hand if he should attempt any thing against them, and the hopes of further advantages should he retain them in his service. For these reasons he bore with

patience the insults of the patriarch; attempting to gain the rest of the Portuguese over to his side. He succeeded perfectly with their commander Arius Dias; who privately renounced the church of Rome, and was baptized into that of Abyssinia by the name command-¹⁵⁴ of *Marcus* or *Marco*; in consequence of which, their renoun-¹⁵⁵ emperor, looking upon him as a naturalized subject, sent him a standard with the Abyssinian arms to be used instead of those of Portugal. This, however, was not delivered; for a Portuguese named *James Brito*, meeting the page who carried it, took it from him and killed him with his sword. The apostasy of Arius is said to have been owing to the great honours which had been conferred upon him by the Abyssinian monarch: for having, in an expedition against Adel, defeated and killed the king and taken the queen prisoner, he bestowed her in marriage on Arius; and that the match might be equal, he raised him also to the royal dignity, by giving him the kingdoms of Doar and Belwa.¹⁵⁶

The alteration on the subject of religion becoming every day more violent, Bermudes was prohibited by the emperor from sending any farther orders to the Portuguese, they being now under the command of Marco the Abyssinian captain-general; meaning Arius Dias, to whom the name of Marco had been lately given. To this the patriarch replied, that being subjects of the king of Portugal, they were under no obligation to obey a traitor to his king and religion; and that since his majesty still persisted in refusing to submit to the pope, he was resolved to leave the empire with his forces. The emperor, however, still insisted that he was absolute in his own dominions; and he expected the Portuguese to pay obedience to his general, and none else. The Portuguese, enraged at this declaration, resolved to die sword in hand rather than submit to such terms; and therefore began to fortify their camp in case of any attack. The emperor, on this, thinking a defiance was given him in his own territories, ordered the camp to be instantly attacked. The attempt was accordingly made, but with very little success; the Portuguese having strewed the ground with gunpowder, set fire to it as the Abyssinians marched along, which destroyed great numbers, and intimidated the rest to such a degree that they instantly fled. Finding it vain to think of reducing them by force, the emperor is then said to have been advised by Marco to consult his own safety, and break the power of the Portuguese by artifice. With this view he sent for the patriarch, pretended to be very sorry for his frequent breach of promise, and desirous to make what amends for it he could. Instead of complying with the patriarch's demands, however, he first ordered his subjects to supply them with no provisions; then he stopped the mouths of the Portuguese by a considerable quantity of gold, giving the patriarch himself a very valuable present; adding to all this a large supply of provisions; but at the same time taking proper methods to disperse their leaders into different parts of the empire, so that they should find it impossible ever to reunite in a body.

Such is the account given of this transaction by the Portuguese historians; but that of Mr Bruce, who says that he translated his from the Abyssinian annals, is somewhat different. He only informs us, that the quarrel betwixt the Portuguese and Abyssinians was inflamed by the "incendiary spirit of the brutish Bermudes;^{from}

Ethiopia.

154
The Portuguese
155
the Roman religion.

156
Hostilities betwixt the Abyssinians and Portuguese.

Ethiopia

Ethiopia.

from reproaches they came to blows; and this proceeded so far, that one night the Portuguese assaulted the king's tent, where they slew some and grievously wounded others." The event, however, was, that no absolut quarrel ever took place betwixt this emperor and any of the Portuguese excepting this patriarch, whom he was on the point of banishing to one of the rocks used as prisons in Abyssinia. This was dispensed with on the interposition of Gaspar de Suza the new Portuguese commander (who had succeeded Arius Dias), and another named *Kajmati Rebel*, both of whom were in great favour with the emperor; and Bermudes persuaded to withdraw to India. According to Mr Bruce, he repaired to Dobarwa, where he remained two years quite neglected and forlorn, saying mass to no more than ten Portuguese who had settled there after the defeat of Don Christopher. He then went to Masuah; and the wind soon becoming favourable, he embarked in a Portuguese vessel, carrying with him the ten persons to whom he had officiated as priest. From Goa he returned to Portugal, and continued there till his death. On the other hand, the Portuguese writers inform us, that he was narrowly watched by order of the emperor; and that Gaspar de Suza, the Portuguese commander, had orders to put him to death if he should attempt to make his escape. Bermudes, however, being determined at all events to make his escape, pretended to be ill of the gout, and that a change of air was necessary for his recovery; for which reason he went to the town above mentioned, where there was a monastery. On this pretence he was allowed to cross the kingdom of Tigré, accompanied by eight faithful servants, with whom he reached Dobarwa unsuspected. Here he remained concealed in a monastery for two years before he could find an opportunity of getting to the island of Masuah, from whence he proceeded to Goa.

157
Bermudes
leaves Abyssinia.

158
A new deputation from the pope.

The emperor was scarce freed from this troublesome priest, when he was in danger of being involved in new difficulties by the intrusion of others into his dominions. Ignatius Loyola, founder of the order of the Jesuits, was at that time at Rome; and so much attached to the cause of the Pope, that he proposed to go in person to Abyssinia, in order to make a thorough conversion of both prince and people. His Holiness, however, who, from what he had already seen of Ignatius, conceived that he might be of greater use to him by staying in Europe, sent in his stead Nugnez Barretto, one of the society of Jesuits, whom he invested with the dignity of patriarch, and honoured with a letter to Claudius. With these commissions, and a number of priests, Barretto sailed for Goa in the East Indies; by which, however distant, the only passage to Abyssinia was at that time. On his arrival at that place he was informed that the Abyssinian monarch had such a steady aversion to the church of Rome, that there was no probability of his meeting with a favourable reception. For this reason it was judged more proper to send some clergymen of inferior dignity, with proper credentials, as ambassadors to the emperor from the governor of India, without running the risk of having any affront put upon the patriarch. These were Oviedo bishop of Hierapolis, Carneyro bishop of Nice, and several others, who arrived safely at Masuah in the year 1558. Claudius, on hearing of their arrival, was greatly

pleased, as supposing that a new supply of Portuguese soldiers were arrived. Finding, however, that they were only priests, he was very much mortified, but still resolved to give them a civil reception. But a more important consideration, and which concerned the welfare of the empire in the highest degree, now claimed his attention. This was the appointment of a successor to the throne, Claudius himself having no son. A project was therefore set on foot for ransoming Prince Menas, the emperor's youngest brother, who had been taken prisoner by the Moors in the time of David, and hitherto detained in captivity on a high mountain in Adel. This was not likely to be accomplished; for the Moors would not willingly part with one who they knew was their mortal enemy, that he might be raised to the sovereignty of a great empire. By detaining him prisoner also, they might reasonably hope for disputes concerning the succession to the Abyssinian throne; which would enable them to attack the empire with advantage. In these circumstances, it is probable that Claudius would have found great difficulty in procuring his brother's liberty, had it not been that the son of the famous Gragné had been taken in that battle in which his father was killed, and in like manner confined on a mountain in Abyssinia. A proposal was then made to his mother, who had escaped into Atbara, that her son should have his liberty, provided the king's brother should be restored. This was accepted; and by means of the bashaw of Masuah, an exchange was made. Four thousand ounces of gold were given for the ransom of Menas, which were divided between the Moors and the bashaw of Masuah; while on his part Claudius set at liberty Ali Gerad the son of Gragné without any farther demand.

According to Bermudes's account of these times, the widow of Gragné was taken prisoner at the battle in which her husband was killed, and was afterwards married to Arius Dias. In this case we must suppose her to have been the same with the *queen of Adel*, mentioned as his consort by other historians; but Mr Bruce treats this account as a mere fable; and informs us, that by means of Nur the son of Mugdid, murderer of the royal family as already related, she made her escape into Atbara. On that occasion Nur fell in love with her; but she refused to marry any man unless he brought her the head of Claudius, who had killed her former husband. To attain his wishes therefore, Nur, now governor of Zeyla, undertook the task; and when Claudius marched towards Adel, sent him a challenge to fight; telling him that there was yet a particular instrument for shedding the blood of the Abyssinian princes, and desiring him to be prepared, as he was very soon to set out to attack him. The emperor did not decline the combat, but is said to have been advised against this expedition by all his friends. This advice seems to have proceeded from a number of prophecies, probably trumped up by the clergy, that he should be unfortunate, and lose his life in the campaign. These prophecies ought no doubt to have had weight with him, as they most certainly indicated a spirit of disaffection among his troops; and the event accordingly evinced that it was so. The Abyssinians fled almost on the first fire, leaving the king in the midst of his dead enemies, attended only by 18 Portuguese and 20 horsemen of Abyssinia, who continued faithful to the last.

159
Prince Menas redeemed from captivity.

160
Nur determined to destroy Claudius.

161
Defeat and death of the emperor.

Ethiopia.

All these were killed after the most desperate resistance; the king himself receiving upwards of 20 wounds before he fell. His head was cut off, and brought by Nur to his mistress, who hung it up on a tree before her door. Here it remained for three years, when it was at last bought by an Armenian merchant, who buried it at Antioch in the sepulchre of a saint of the same name. Nur gained on this occasion a very complete victory; the king and most of the principal nobility being killed, a great number made prisoners, and the camp taken with an immense booty. On his return to Adel, he refused to accept of any congratulations, or to allow rejoicings to be made for his victory, but passed along in the habit of a common soldier mounted on an ass; saying, that he owed the victory to the mercy of God alone, who had immediately interposed for the destruction of the Christian army.

162
Reign of
Menas.

This fatal engagement took place on the 22d of March 1559; and as the succession had been already settled, Menas ascended the throne without any opposition. On his accession he found his affairs in great confusion, and he had still to contend with foreign and domestic enemies. The first of these was Radaet the king of the Jews, who had a territory in the empire of Abyssinia, the capital of which was on a rock named *Samen*. The cause of this quarrel is not known, but the event was unfortunate; the king being obliged to abandon the enterprise, after having bestowed a considerable time upon it. This was followed by an attempt to assassinate him, which had very near taken place; and this again by a conspiracy among his principal nobles headed by Isaac the Baharagah. He had been a very faithful servant of the late emperor Claudius; but ill used by Menas, who was of a very haughty and morose disposition. In attempting to suppress this rebellion, the first attempts of the emperor were likewise ineffectual, his forces being attacked by surprise and entirely defeated. Soon after this, Isaac proclaimed Tsfar the nephew of Menas, who was then at liberty, king of Abyssinia; hoping thereby to strengthen his cause, and enable him to cope with the emperor, who was assembling a powerful army against him. This expedient did not answer the purpose. His army was entirely defeated by Menas; Tsfar taken prisoner, and thrown headlong from the top of a precipice; and Isaac himself escaped with great difficulty to the confines of his own government in the neighbourhood of Masuah. Here he entered into an alliance with the Turkish bashaw of Masuah; whose friendship he gained by putting him in possession of the town of Dobarwa, with the flat country adjacent, which abounds with the provisions wanted at Masuah, and is looked upon as the key to the province of Tigre and the high-lands of Abyssinia. Besides this, Isaac strengthened himself also by an alliance with the Portuguese; which, had their numbers been at all considerable, must have been very formidable. Their inclination to desert their former protector and ally the emperor, proceeded entirely from the shameful behaviour of their priests, who never would be satisfied without enslaving the emperor as well as his subjects to the tyranny of Rome. We have already seen that Bermudes had proceeded so far on this subject, that he narrowly escaped with his life. His successor Oviedo (for the patriarch Nugnez died by the way) fared still worse. On his introduction to the

163
Rebellion of
Isaac the
Baharagah.164
He is de-
feated.165
Allies with
the Turks and Portu-
guese.166
Reason of
their quar-
rel with the
emperor.

Ethiopia.

emperor Claudius, he informed him, that the pope and king of Portugal now expected no less than an immediate fulfilment of his engagements of submission to the see of Rome. This requisition was made with such an air of insolence, that the prince could scarce conceal his resentment; but restraining his passion, he promised to consider of it, and to call meetings of the learned in these matters to debate the point. This was a very fruitless task; and therefore Oviedo thought proper to quit the court towards the end of December 1558; leaving behind him an insolent letter addressed to the Portuguese and such converts as they had made; in which he exhorted them not to converse with schismatics, and the Abyssinians to forsake their errors. Being now debarred from access to the emperor, he began to entertain the people with seditious discourses; which practice he continued during the remaining part of the reign of Claudius and the beginning of that of Menas. The latter, perceiving the pernicious tendency of his discourses, positively commanded him to desist; which the patriarch refusing, the emperor fell upon him with his own hands, beat him severely, tore his clothes and beard, and took his chalice from him that he might thus be disabled from saying mass; after which he banished him, with Francis Lopez another of his associates, to a barren mountain, where they remained seven months in great misery. Not content with this, he issued many severe edicts against the Portuguese; prohibited them from intermarrying with the Abyssinians; and such of the Abyssinian women as were already married to Portuguese husbands, he commanded not to accompany them to their churches. His next step was to call Oviedo again into his presence, and command him, under pain of death, instantly to leave his dominions. The insolent and foolish priest refused obedience to this express command; he declared that he would obey God rather than man; and presenting his bare neck to the emperor, desired him to strike and put an end to his life at once. Menas drew his sword, but was prevented by the queen and officers who stood near him from giving the fatal stroke. A second beating and banishment to the mountain succeeded; and in the latter part of the sentence all the Portuguese priests as well as others were included. The Portuguese, however, determined not to submit to such an indignity; and therefore, to a man, joined Isaac; who, in expectation of more auxiliaries from India, professed a great desire of embracing the Romish religion. The king was very apprehensive, and not without reason, of the arrival of more Portuguese; but it appears that Oviedo had not sufficient interest to procure the supply he promised. An engagement, therefore, took place without them, in which Menas was again victorious; though the battle was not so decisive as to put an end to the rebellion.

167
Oviedo ban-
ished to a
mountain.168
Is com-
manded to
leave the
empire,
but refuses.169
Sentence of
banishment
passed on all
the Portu-
guese, who
thereupon
join the
rebels.170
An engage-
ment, in
which Menas
defeated.171
Reign of
Sertza
Denghel.

The emperor died a short time after his victory, and was succeeded in 1563 by his son Sertza Denghel, then only 12 years of age. The beginning of his reign was disturbed by new rebellions; which, however, were happily suppressed. Isaac, with his allies the bashaw and the Portuguese, seem to have remained for some time unmolested; and in the year 1569, a kind of accommodation took place. It is by no means easy to say how the Portuguese were again received into favour after such flagrant treachery and rebellion. Mr

Bryce

Ethiopia.

Bruce only simply tells us that "Oviedo and the Portuguese did not appear at court." This indeed is not to be wondered at, as they had been so lately at open war with the emperor. Other accounts say, that after the last battle with Isaac, "their name became so odious to all the Abyssinians, especially to their monarchs, that they would never suffer any of them to be in their army from that time." Some of these accounts say also, that Menas was defeated and killed in another battle; others, that he was driven to some high mountains, where he wandered about till death put an end to his misery. Accounts of this kind, however, are by Mr Bruce treated as mere falsehoods, and expressly contradictory to the annals of those times. All we can say upon the subject therefore is, that after the defeat of Isaac, the Portuguese, not excepting Oviedo himself, remained in Abyssinia, where they were more favourably dealt with by the new emperor than they had been by his father; though he was no friend to their religion, as supposing it to be destructive of monarchy and all civil government. It is probable also, that the various disturbances which happened, together with his own tender age during the beginning of his reign, would prevent him from paying that attention to them which he would otherwise have done. The Galla, a very barbarous nation, and who have at last greatly reduced the power of the Ethiopian monarchs, made frequent inroads during this reign; and in the year 1576, a league was formed by Mahomet king of Adal, with Isaac and the Turkish bashaw, who had either continued their hostilities, or renewed them about this time. The emperor, however, marched with such expedition, that he did not allow them time to join their forces; and attacking them separately, gained a complete victory over them all. Almost the whole Moorish army was destroyed; but while the emperor entered Adal with a design to make a full end of his enemies on the east, he received information that the Galla had invaded him on the west. Travelling the whole breadth of the empire therefore with the utmost expedition, he came up with these enemies, who were afraid to encounter him. On this he turned his arms against the Falasha, obliging them to deliver up their king, whom he banished to a mountain. Then invading the country of the Galla and Falasha, he ravaged it for four years successively, protecting at the same time the kingdom of Narea from the inroads of the Falasha, these barbarians.

173
Isaac and the
Bashaw
league with
the king of
Adal;

173
But are en-
tirely de-
feated.

174
The emper-
or invades
and ravages
the country
of the Galla
the same time
the kingdom of
Narea from the
inroads of
the Falasha,
these barbarians.

175
Tigré inva-
ded by Cad-
ward Ba-
shaw.

176
King of the
Falasha de-
feated and
killed.

own troops, not only waited him patiently, but gave him every advantage he could desire. A very desperate battle ensued; the event of which was doubtful, till Robel, commander of part of the king's household troops, who were armed with pikes, attacked that part of the Turkish horse where he saw the bashaw, and killed the officer who carried the standard. In doing this he broke his pike; but though then destitute of any other weapon than a short crooked knife which the Abyssinians always carry in their girdles, he instantly pushed up to the bashaw, and with it wounded him mortally in the throat. This unexpected event instantly decided the victory; the Turkish horse betook themselves to flight, and the rest of the army soon followed their example. A dreadful slaughter ensued among the Moors, who were pursued to the island of Masuah; and many were driven into the deserts, where they perished with thirst. After this, marching back to the western part of his territories, the emperor proceeded to Narea, destroying the Galla as he went along. His last expedition was towards Damot to chastise some rebels there. Before he set out, a priest of great sanctity and talent for divination, is said to have warned him not to undertake the war; but his advice was rejected with contempt: on which he requested him only not to eat the fish taken out of a certain river; but this advice was also neglected, and the fish being really of a poisonous nature, the king died in consequence of eating them.

Ethiopia.

177
The ba-
shaw de-
killed.

178
Death of
the emper-
or.

On the death of Sertza Denghel a dispute ensued about the succession. In the beginning of his sickness the late king had named for his successor his son Jacob, a boy of only seven years of age; but finding death approaching, he named his nephew Za Denghel, as being come to the years of manhood, and more fit for the government of such a numerous and turbulent people. This last resolution proved highly disagreeable to the queen and some of the principal nobility, who wished for a minority, during which they might engross the power into their own hands. In conjunction with her two sons-in-law, Kessa Wahad and Ras Athanasius, therefore, the empress determined to raise Jacob to the throne.

179
Two succe-
ssors nomi-
nated.

180
Jacob raised to the throne.

Therefore, the empress determined to raise Jacob to the throne, notwithstanding the final determination of the late king abovementioned. This was put in execution immediately after the death of Sertza Denghel; Jacob was raised to the throne, and Za Denghel confined in an island of the lake Dembea or Tzana. An attempt was likewise made to seize Sueinios, natural son to Faciliadas grandson of the unfortunate David, who had likewise a claim to the throne; for his not being born of a lawful marriage, was no objection in Abyssinia. Sueinios, however, no sooner saw the fate of his cousin Za Denghel, than he withdrew himself from the power of his enemies; and Za Denghel himself, after being a short time confined in the island above mentioned, found means to escape, and took refuge among the inaccessible mountains of Gojam.

Thus disappointed in their attempts on the princes, the empress, with her two sons-in-law, were obliged to pretend loyalty to Jacob, whom they governed till he was 17 years of age. The young king then perceiving that his tutors were taking some steps to prolong their dominion over him, took the government into his own hands, and banished one Za Selsie, whom they had employed in the execution of their projects,

¹⁸¹ Ethiopia. to the kingdom of Nare. The conspirators, alarmed at this bold exertion of royal prerogative, determined instantly to depose Jacob, and raise Za Denghel, whom they had banished, to the throne. This, however, was now a matter of some difficulty, as he had concealed himself so effectually among the mountains of Gojam, that he could scarce be found out. His retreat being at last discovered, Ras Athanasius took an opportunity of insinuating Jacob, even while sitting on the throne; called him an obstinate, stubborn, and foolish boy; declared him degraded from the imperial dignity, and that Za Denghel was coming to supplant him. Jacob, perceiving by the inference of this speech, that he was entirely in the power of his enemies, left his palace in the night, in order to fly to the mountains of Samena, where his mother's relations were, from whom he expected protection. He got to the borders of that country, but was there discovered, seized, and brought back to his rival, who was now seated on the throne. Za Denghel, however, with a clemency not very usual in Abyssinia, did not either put him to death, or mutilate him in such a manner as to render him incapable of afterwards enjoying the kingdom; but contented himself with banishing him for life to Nare.

¹⁸² Jacob b- banished. Za Denghel was no sooner settled on the throne, than he unluckily behaved in such a manner as to alienate the affections of his people from him entirely. This was occasioned by his attachment to the church of Rome. Ever since the time that the Portuguese had joined Isaac the Baharnagash, the entrance into Abyssinia had been shut up by the Turks, so that no new missionaries could have access; and all those who came with Oviedo being dead, the Romish religion had languished for want of preachers to support it. The last of these died in 1596; and all the rest having been dead some time before, little could be expected from the labours of a single person. Next year Melchior Sylvanus, a vicar of the church at Goa, was sent on a mission to Abyssinia; being supposed to be a proper person for this work, on account of his language and complexion, which might baffle the vigilance of the Turks. He entered without being suspected; but the great defeat given the Turks by Sertza Denghel already mentioned, had reduced their power so much, that less danger now attended this expedition than formerly, and other missionaries quickly followed.

¹⁸⁴ Peter Paetz restores t. The most learned, as well as the best qualified for the undertaking in every respect, was *Peter Paetz*, who came to this country in the year 1600; and on his taking upon him the whole charge of the mission, Sylvanus returned to India. The new missionary did not at first affect to intrude himself on the emperor; but taking up his residence at the convent of Fremona in the province of Tigie, he first applied to the study of the learned language of the Abyssinians called *Geez*, and in which their books are usually written. In this he made such progress as quickly to surpass the natives themselves; after which he set up a school, where the children of the Portuguese and Abyssinians were taught promiscuously. The progress made by his scholars was so great, that he was spoken of at court, and recommended in the warmest terms to the emperor Jacob before his deposition. On this he was sent for, and appeared before the court in 1604; where, to

the great dissatisfaction of the Abyssinian monks, he received such honours as are usually bestowed on men of the first quality. Next day, in a dispute before the king, two of his scholars, whom he had brought along with him, fairly vanquished the best theologians that could be found to oppose them. Mafo was then said in the Roman manner; and this was followed by a sermon, which in the purity and elegance of its diction (whatever the substance might be) excelled any thing that had ever been composed in the Abyssinian language.

Though Paetz had been called to court by Jacob, yet Za Denghel was on the throne before he arrived, and it was he who witnessed the dispute and heard the sermon. He was so much charmed with the latter, that he instantly resolved to embrace the religion of the church of Rome; which resolution he soon after communicated to several of his friends, and even to Paetz himself; but under an oath of secrecy. The emperor's own zeal, however, rendered this oath of no use; for in a little time he issued proclamations forbidding the observation of the Jewish Sabbath, and wrote letters to Pope Clement VIII. and Philip III. of Spain, desiring a supply of mechanics to instruct his people in the useful arts, and Jesuits to teach them religion.

This precipitate conduct had the effect which might have been expected. The Abyssinians were generally disaffected to the church of Rome, and no pains had been taken to gain them over: they were also turbulent, savage, and rebellious; ever ready to revolt; and now had a favourable opportunity of excusing their treasons under pretence of zeal for religion. This opportunity was quickly made use of by Za Selasse, whom, as we have already mentioned, Jacob had banished; but who, on the advancement of Za Denghel, had probably been set at liberty. This traitor having first held many seditious meetings in private, prevailed on the Abuna, or Abyssinian patriarch, to excommunicate the king, and absolve his subjects from their allegiance. He then set out for the territory of Gojam, where the people had always been remarkable for their aversion to the church of Rome. In this place, therefore, he found no difficulty in raising an army to fight against his sovereign. Za Denghel, who was an expert warrior, did not fail to go in quest of him with what forces he could raise; but soon found, by the great desertion among his troops as he passed along, how much the excommunication pronounced by the Abuna had availed. This was so alarming, that John Gabriel, an experienced Portuguese officer, advised him to decline an engagement for the present, and take shelter in some fortresses until his subjects should return to a sense of their duty. This salutary advice was rejected, from the absurd notion that it was a dishonour not to fight a rebel who had defied his sovereign. In the beginning of the engagement, victory seemed to favour the royal cause. The Portuguese carried every thing before them, and routed that wing of the enemy which opposed them. In the other wing, however, the cowardly and treacherous Abyssinians deserted their king, who was quickly surrounded by his enemies, and left in a desperate situation. A body of nobility, with his own officers and domestics, attended him and fought desperately in his defence. Za Denghel himself, being an excellent horseman, and admi-

Ethiopia.

¹⁸⁶ The emperor embraces the Catholic religion.

¹⁸⁷ His imprudent conduct occasions a rebellion.

¹⁸⁸ The emperor excommunicated.

¹⁸⁹ An army raised against him.

¹⁹⁰ He is abandoned by his troops and killed.

¹⁸⁵ He arrives at court.

Ethiopia. skilled in the use of arms, performed astonishing feats of valour. At last he was thrown to the ground, grievously wounded in the breast by a lance. Notwithstanding this, he instantly recovered himself, drew his sword, and resisted his assailants so violently, that they were fain to keep at a distance and annoy him with missile weapons. In this situation he stood till almost fainting with fatigue and loss of blood; when the traitor Za Sclafse, pushing up his horse violently against him, threw him to the ground by a blow on the forehead, and a multitude then rushing upon him he was dispatched with many wounds.

191
His death
universally
lamented.

The news of Za Denghel's death were received with great general indignation throughout the Abyssinian empire, that the rebels durst not name any successor. As it seemed natural to think, however, that Jacob would now be re-elected, messengers were dispatched

192
The empire
claimed by
Socinius.

to acquaint him of his good fortune; but during this interval Socinius appeared, not as a candidate, but as already in possession of the empire, and ready to support his rights by force of arms. His first step was to let Ras Athanasius know his pretensions to the throne, and desire his assistance with his army, promising to reward him as soon as it should be in his power. Without waiting for any answer, he advanced

so rapidly, that Athanasius had scarce time to consider what he should reply, when a second message was sent, importing that Socinius was in the neighbourhood, and ordering preparations to be made for receiving him as his sovereign. This expeditious mode of action so much confounded Athanasius, that he complied with the requisitions, saluting him king, and joining his troops to his. Thus successful in his first attempt, Socinius made a similar one on Za Sclafse. In this, however, he was disappointed. Za Sclafse having first sent an equivocal answer, marched against him with his whole army; while Socinius, happening to fall sick, and putting little confidence in Athanasius, withdrew to the mountains of Amhara. Athanasius likewise, not knowing to whom he should attach himself, withdrew his forces, and stood neuter.

193
He is ob-
liged to
retire.

Za Sclafse had refused to join Socinius, in expectation that Jacob would make his appearance, whom he rather wished to enjoy the crown than Socinius; as under the former he might hope to engross all the power to himself. For a long time, however, no answer was returned to his messages; his troops became impatient; so that fearing lest a mutiny or general desertion should take place, he dispatched a messenger to Socinius, acknowledging him for emperor. But scarce was this done, when a messenger arrived from Jacob, informing him that he was then in Dembea, and promising Za Sclafse great honours if he would acknowledge him for his sovereign. With these terms the traitor instantly complied, and his example was followed by Athanasius; while Socinius, not as yet able to resist all his enemies, retired again to Amhara. This, however, he was not long of accomplishing. Jacob was by no means possessed of equal military skill; and though Za Sclafse was an experienced officer, yet his extreme perfidy, pride, and obstinacy, rendered it very dangerous to have any concern with him. This appeared remarkably in the present case. His pride in the first place would not allow him to join his forces to those of Jacob, lest the latter, who was inferior in

194
Jacob set
up in op-
position to
him.

him. Jacob set up in opposition to him.

195
Bal con-
duct and
defeat of
Za Sclafse:
Jacob's ge-
neral.

Bal conduct and defeat of Za Sclafse: Jacob's general.

military skill, should have a share in the victory he was to gain. Then, intoxicated with his opinion of himself, he neglected to behave with the caution necessary in the neighbourhood of such an experienced general as Socinius, which gave the latter an opportunity of cutting off almost his whole army. Being now obliged to fly with a few attendants to Jacob's camp, he met with an indifferent reception on account of his defeat; for which reason he made proposals to join Socinius. The latter accepted his offer, though he could put no confidence in one who had been guilty of such complicated treachery; only he thought it would be an advantage to put it out of his power to join his antagonist. Jacob, on the other hand, confident in his numbers, which are said to have been almost 30 to 1, advanced boldly to give his antagonist battle. Socinius declined the engagement till he had drawn him into a situation where his numerous forces could not act; so that a dreadful carnage ensued, Jacob himself perishing among the multitude, and his body being never found afterwards. In this battle also was killed the wicked priest Abuna Petros, who was the occasion of Za Denghel's death, as we have already related. Ras Athanasius escaped by the swiftness of his horse, and took refuge in a neighbouring monastery. He was afterwards pardoned at the intercession of Peter Paez; but his goods and estate being confiscated on various occasions, falling into universal contempt, and being abandoned by his wife, he died at last of want. According to the Abyssinian accounts, Socinius ordered the pursuit to be stopped as soon as he saw the head of Abuna Petros; but the Portuguese writers inform us, that he kept it up with the utmost vigour throughout the whole day and part of the night. They particularly mention, that a number of Portuguese, who had joined the army of Jacob, lost their lives on this occasion, by falling over a precipice which they could not avoid in the dark. One of these named *Mannel Gonzalez* had the good luck to light on a tree, where he sat till morning in the utmost terror, but at last made a shift to clamber up and escape.

By this victory Socinius was fully established on the throne, though his situation might still be accounted precarious by reason of the rebellious disposition of many of the provinces. He began with making a general proclamation of pardon, excepting only the murderers of Za Denghel, with whom he had been in terms of intimate friendship. Being informed therefore, that one *Mabardin*, a Moor, had given him the first wound in that battle in which he was killed, he ordered his head to be instantly struck off with an ax before the gate of the palace.

The Portuguese were much favoured by this prince; Socinius fa-
and they were become very numerous by contrivances the
naal intermarriages with the Abyssinians; the male
children being always trained to the use of fire-arms
by their parents, and incorporated as soldiers with
them; and they were now all united in one body un-
der an experienced officer named *John Gabriel*, whom
we have already had occasion to mention. As their
numbers and valour made them objects of confide-
ration, Socinius determined to attach them to him-
self as much as possible; and the best means to do this
he knew was by favouring their priests. Peter Paez
was therefore sent for to court; where a dispute con-
cerning

Ethiopia.

196
Jacob de-
feated and
killed.

197

Ethiopia.

Ethiopia.

198
He resolves
to embrace
the Catho-
lic religion.

cerning the supremacy of the pope and the two natures of Christ (the great subjects of debate in Abyssinia), took place, and a sermon was preached with as great success as that in Za Denghel's time. The king first enlarged the territory possessed by the Jesuits at Fremona; after which he declared to Paëz his resolution of embracing the Catholic religion; giving him at the same time two letters, one to the king of Portugal, the other to the Pope, the purport of which was to request a number of more Portuguese to deliver Abyssinia from the incursions of the Galla, as they had formerly done from the yoke of the Moors.

199
An impostor, pretending to be the late emperor, Jacob appears.

200
Is defeated.

Before any thing of importance could be done in matters of religion, the king was called forth to suppress a rebellion which had already taken place. An impostor had appeared, who called himself *Jacob* the late king, and pretended to have escaped from the battle; but so much wounded in the face that he kept one side of it constantly covered to conceal the deformity. He made his appearance among the mountains of Habab near Masuah; and being joined by great numbers of people, Sela Christos, brother to the king, and governor of Tigré, marched against him. The impostor's troops, though numerous, fled at the first onset; but he escaped to the mountains, where it was very difficult to follow him. This, however, was attempted; and a great many of the posts he had taken were stormed like as many forts: but still the impostor himself, though driven from place to place, found means to make good his retreat to the country lying between the mountains of Habab and the territory of the Baharnagash. Thither he was pursued by Sela Christos; but that general, finding the rebellion likely to spread through the whole province of Tigre, thought proper now to acquaint his brother Socinios with the state of affairs, and to desire his assistance. The king, though at that time he had sent away most of his troops in an expedition against the Shangalla and Gongas, who dwell on the northwest of Abyssinia, set out immediately with such troops as he could collect. There were but few in number; his cavalry particularly, amounting to no more than 530, besides a small reinforcement brought by his brother Emana Christos, governor of Amhara. As he proceeded, he was informed that a party of Galla were lodged on a hill at no great distance from him. Determining to cut them off, he surrounded the hill where they were posted; but having caused his cavalry to advance before, and pass a deep ravine, they were almost entirely destroyed, while the rest of the army were seized with such a panic that they refused to stir. In this extreme danger, the Galla passed the ravine to attack them; but the king having advanced singly, and killed the first of them, his troops, ashamed of their cowardice, rushed forward on the enemy, and gained a complete victory, which obliged the savages to leave the province they infested at that time.

201
The Galla
defeated.

202
The impostor Jacob again defeated.

The misfortune of the cavalry on this occasion quickly occasioned a report that the king had been defeated; of which the impostor Jacob did not fail to take advantage; and descending from his mountains, committed great devastations in the low country. But though attended by a great multitude, who likewise fought with more obliquity than formerly, he was still defeated by Sela Christos with a force greatly inferior.

But before any thing effectual could be done for his reduction, the Galla made a dreadful irruption into the southern provinces, murdering all who fell into their hands, and burning and destroying towns, churches, and villages, in the most dreadful manner. The king bore those excesses for some time with patience, till at last he drew them into such a disadvantageous situation, that being surrounded by his forces, and inferior in number as well as in valour, they were all cut off to a man, with the loss of only 400 on the part of the Abyssinians. Soon after this victory the king underwent the ceremony of coronation. He then marched against the impostor Jacob; but the latter was too sensible of the superiority of his rival to face him in the field. He therefore retired again to his mountains, while the king left the suppression of the rebellion to an experienced officer named Amfala Christos; who employed two young men, that had been outlawed for murder, to assassinate the impostor. This being done, it was found that the pretended Jacob was no other than a herdman among those mountains to which he so constantly fled for refuge; and that he had neither wound nor scar on his face, but had kept one half of it covered to conceal the little resemblance he bore to Jacob whom he persecuted.

The king being now freed from this rebellion, began again to turn his thoughts towards religion. His first step was to make an handsome present to the Jesuits; but he soon showed his inexperience in religious matters, by attempting to reconcile the two contending parties in his empire. Before he could see the folly of this attempt, however, his attention was called by a most dangerous rebellion, which was begun by one Melchizedec, a servant of the late Sertza Denghel, but a man of great experience in war. He was first opposed by Sanuda, a brave officer; but being totally destitute of troops, he was obliged to apply to the attendants of the king of Sennar, who had been deposed by his subjects, and was at that time in Abyssinia. These readily joined him; and a bloody battle ensued, in which Sanuda was so totally defeated, that he alone had the good fortune to escape, and that grievously wounded, his men being all killed on the spot. On this misfortune Socinios sent his brother Emana Christos with a considerable force to reduce the rebels. Melchizedec finding himself opposed by such an able general, exerted himself to the utmost, in order to raise a force sufficient to resist him; and in this he succeeded so well, that his army soon struck terror into all the neighbouring country, notwithstanding the presence and known valour of the king's brother. A prince of the blood-royal, named *Arzo*, was likewise found out and proclaimed king, in order to give some sanction to the rebels; soon after which they boldly marched to meet the royal army. The engagement took place on the 9th of March 1611, and was fought with great obliquity on both sides: the advantage even appeared for some time on that of the rebels; till Emana Christos, perceiving that all was at stake, pushed desperately forward to the place where Melchizedec himself was. The latter seeing no probability of avoiding a single combat, which he did not choose to try, instantly turned his horse and fled; and the rest of the army soon followed his example. Melchizedec,

5 E 2 however,

Ethiopia.

209
Is defeated
taken pri-
soner, and
put to
death.

210
The rebel-
lion conti-
nues.

211
Cruel man-
ner of car-
rying on
the war.

212
Amdo, an-
other im-
pulsor, sup-
ported by
the Jews.

213
War with
Gideon.

214
Amdo de-
livered up
and put to
death.

however, did not much avail himself of this cowardice; for he was closely pursued by the peasants, taken prisoner, and executed as a traitor, together with several of his principal officers. The fate of Prince Arzo, whom, to support their cause, the rebels had proclaimed king, is not known.

This victory, so far from extinguishing the spirit of rebellion, seemed to have inflamed it beyond all bounds: for news were now received that the whole country round the head of the Nile to the province of Tigre had revolted; so that there was a necessity for the immediate presence of the emperor himself; and even this was insufficient, as the rebels were dispersed over such a large tract of territory. His two brothers, Emana and Sela Christos, were therefore both employed against different rebel chiefs, while the king marched against those who were most formidable. The principle on which this war was carried on seems to have been very cruel, viz. that of killing all the men, and carrying off the women and children for slaves. This was punctually executed, first upon the inhabitants of a mountainous district named *Gufman* on the Nile; though, at the intercession of the missionary Peter Pazé, the women and children, instead of being sold for slaves, were given to the Jesuits to be educated in the Catholic religion. The Gongas and Agows were next attacked with equal success, and still greater cruelty; one of their tribes, named *Zalabassa*, being almost entirely exterminated: but this, instead of having any good effect, seemed to multiply the rebels still more.

The Agows and Galla invaded the provinces in the neighbourhood; and another impulsor, whose true name was *Amdo*, but who pretended to be the unfortunate emperor Jacob, appeared as a competitor for the crown. This last rebel proved much more formidable than any of the rest. He was indeed surprised before he had time to collect any forces; but Gideon, king of the Jews of Samen, having killed the guards who watched him, set the impulsor at liberty, and supported his cause. Thus he soon collected a very formidable army, with which he defeated and killed an officer named *Abram*, who opposed him with a considerable force. This brought Socinius himself against him, who instantly attacked the Jewish monarch Gideon, as being the principal support of his cause. As the country of the Jews was naturally strong, and very full of fortified places, the reduction of it was evidently a very difficult task. The first place attacked was a fortress named *Masfiraba*; which, though very strongly fortified and garrisoned, was soon taken by storm, and every one in it put to the sword without distinction. Hotchi and Amba Za Hancasse, two other strong fortresses, shared the same fate. A fourth, named *Sengannat*, no less strong than any of the former, was also taken; Gideon himself narrowly eluding with his life in the attack. Discouraged therefore by so many misfortunes, and apprehending the total ruin of his country, this prince at last was content to sue for peace; which was granted on condition that Amdo should be delivered up. This traitor was condemned to a punishment very unusual among Christians, viz. that of being crucified; but in nailing him to the cross, his cries and groans so much affected the king, that he ordered him to be taken down and beheaded.

The war was now resumed against the Gongas and

Guba; whom the king annually invaded for the purpose of making slaves. In this expedition his officers not only executed their commission against these savages, but likewise carried off a great number of cattle from the Agows, who were then at peace with the emperor. This conduct was highly resented by Socinius, who obliged them to make restitution of what they had taken away; and the doing them justice in this particular, had more effect in reducing the rest of these people to obedience, than all the cruelties which had been committed since the beginning of the war.

In 1616, the emperor set out on an expedition against the Galla; but this was laid aside on the death of his eldest son, for whom he entertained a great affection. It was succeeded by a very cruel order against the Jews, whom Socinius now determined to exterminate without any apparent occasion. His commands, however, were executed with the utmost punctuality, so that very few escaped; and among the rest perished their prince Gideon lately mentioned. He was supposed to be immensely rich, and to have concealed his riches, which have been sought for in vain by the Abyssinians from that time to the present. The children of the murdered Jews were sold for slaves; and such of the profession as were scattered through the empire, had orders to renounce their religion and be baptized, under pain of death. Thus almost the whole Jewish religion was extinguished at once, as most of them chose rather to embrace Christianity than suffer death. In token of the sincerity of their conversion, they were all ordered to plow and harrow on the sabbath day.

This butchery being over, the expedition against the Galla was resumed, and carried on with the usual cruelty; while the Galla never once appeared to prevent the desolation of their country. Next year, however, a new association was made among these savages, and the empire invaded by them in two different parts at once. One of their armies was cut off to a man before they had time to begin their ravages; while the other fled on the first approach of the royal army, leaving their wives, children, and baggage, to the mercy of the enemy. Thus the king was left for a short time at rest from rebellions or foreign invasions; and this interval he determined to make use of in making war on his neighbour the king of Sennar, from whom he had formerly received an affront. In this expedition Sennar, he was assisted by one Wed Ageeb, a prince of the Arabs, who lived on the frontiers of Abyssinia. The allies proceeded with their usual cruelty, killing all the men, and selling the women and children for slaves. Vast numbers of cattle were carried off; and the victorious armies returned with an immense booty. The next expedition was against Fatima queen of the Shepherds, otherwise called *queen of the Greeks*, who resided on the north-east of Atbara. In this also the king proved successful, though less blood was shed than usual: but it was not long before this extraordinary success met with a severe check by the entire loss of an Abyssinian army; the favourite son of the emperor himself being killed in the engagement, with some of the best officers in the empire.

All this time Peter Pazé had applied himself with the utmost assiduity to the conversion of the Abyssinians to the Catholic faith; and in this undertaking

Ethiopia.

215
Other mil-
lary ex-
peditions.

216
The Jews
determined
to extermi-
nate.

217
Succes-
sful ex-
pedition
against the
Galla.

218
War with
Sennar,
&c.

219
Prop. of
the Rous-
sillon.

Ethiopia. he had been attended with wonderful success. He was indeed of all others the most fit for an undertaking of this kind among a rude and barbarous people. Besides an uncommon share of learning, he possessed an eminent degree of skill in the mechanical arts; by which he was enabled to teach the Abyssinians how to build houses of stone and lime, which they had never known before. In these he was at first mason, carpenter, smith, and architect; himself; and thus, to the astonishment of the whole empire, he built some churches and a palace for the king. His universal genius prepared the people for the reception of his opinions; while the barbarous ignorance and savage manners of his antagonists tended to prejudice every one against their tenets, though ever so just in themselves. Sela Christos, the king's brother, is said to have been converted by only reading the Abyssinian books with attention; in which, it seems, the ignorance of the priests had been displayed in an extraordinary manner. We have already seen how well the emperor himself was disposed towards the Romish church; and his example was followed by many of the principal people of the kingdom. At last the Abyssinian patriarch named *Simon* made a complaint, that irregularities in religion had been committed; and disputes held on matters of faith without calling him, or permission granted him, to support his clergy in these controversies. As *Socinius* had no opinion of this priest's learning or eloquence, he did not imagine that any harm could ensue to the cause from granting what he wanted. A public dispute was accordingly appointed; in which *Simon's* inferiority was so apparent, that *Socinius* now publicly declared his belief in the two natures of Christ.

221 While the conversion was in this prosperous way, letters arrived from the pope and king of Spain, but without any promise of the temporal assistance, viz. the soldiers he had solicited; though they assured him of an ally far superior, the Holy Spirit himself, provided the emperor continued firm in his resolutions of embracing the Catholic faith. *Socinius* would probably have been as well satisfied with an account of a reinforcement of soldiers; but as matters stood, he was obliged to be content, and resolved to submit in form to the pope, renouncing for ever his connection with the Greek church. As it was improper, however, to send letters on a subject of such importance by a common messenger, proper persons were to be appointed who might occasionally assume the character of ambassadors, and act accordingly. This being resolved on, the next thing was to determine the way by which the ambassadors were to reach Europe. The usual track by *Masrah* was now shut up on account of the rebellion which existed in the neighbouring provinces; so that the more eligible way seemed to be through *Narea* and the provinces to the southward, by which they might reach *Melinda*, and from thence embark for *Goa*.

222 The ambassadors were chosen by lot; which falling first on *Antonio Fernandez*, he named *Fecur Egzie* as his companion; and, all things being settled, these two set out for *Gojam* in the beginning of March 1613. It seems surprising that the Abyssinian monarch should have sent these ambassadors on such a dangerous expedition without a proper guard through

the barbarous countries they had to pass. This, however, seems undoubtedly to have been the case; as we hear of no other attendants they had than 10 Portuguese taken with him by *Fecur Egzie*, six of whom were to go no farther than *Narea*, but the other four were to proceed to *India*; forty men armed with shields and javelins were also granted, but this force was undoubtedly too small to answer any useful purpose. *Sela Christos* indeed furnished them with guides from the barbarous nations in the neighbourhood of *Narea*, taking hostages for the security of the travellers; but the insufficiency of these precautions soon appeared. Our travellers had proceeded but two days' journey into the country of the *Gongas*, when they were treated in such an hostile manner, that one of the Portuguese was obliged to return with *Fernandez* to complain of the behaviour of the savages. On this information *Sela Christos* instantly dispatched three officers, with a proper number of troops to chastise them; by which means the ambassadors got safe to *Mine*, the name of some miserable villages on a ford of the Nile. Here they crossed the river on skins blown up, and next day entered the country of the *Pagan Galla*; and soon after, though not without great difficulty, they reached the kingdom of *Narea* the most southerly province of the Abyssinian empire, but quite surrounded by the *Galla*. Here they were received with great kindness by the commanding officer of the first fortified place they came to; but on being introduced to the king himself, they met with a very indifferent reception. This was owing to the insinuations of an Abyssinian monk, that they were to bring Portuguese soldiers that way into Abyssinia; which would be destructive to his kingdom. On calling a council, it was resolved to send them into the kingdom of *Bali*; so that they would be obliged to pass through a much more difficult and dangerous road than what was first intended. Having thus, as he supposed, provided against the danger which threatened his kingdom, he made them a present of 50 pieces of gold, recommending them at the same time to the ambassador from the sovereign of *Gingiro*, thro' which they were next to pass.

On leaving *Narea*, they received a convoy of 80 soldiers to conduct them safely to their next stage; after which they passed four days through countries totally laid waste by the *Galla*, and where they were obliged to hide themselves for fear of meeting with these savages. Proceeding still through woods and vast chains of mountains, they came to the river *Zebee*, or more properly *Kibbes*, from its white colour resembling melted butter, as the word imports. *Fernandez* describes this river as larger than the Nile, and vastly more rapid. They passed it by a kind of bridge, but certainly a most tremendous one. The channel of the river is full of rocks; and betwixt every two of these a single tree was laid, so elastic that it would bend with the weight of one person; while the vast height of the precipice, and the sight of the roaring current below, was sufficient to strike the boldest with terror. At a small distance from this bridge was a ford, through which it was necessary that their mules should pass; which being accomplished without any accident, though with difficulty and danger, they entered the territory of *Gingiro*. Here they were hospitably received by the sovereign, and after a mutual exchange of presents proceeded to *Sana*.

223 The ambassadors were chosen by lot; which falling first on *Antonio Fernandez*, he named *Fecur Egzie* as his companion; and, all things being settled, these two set out for *Gojam* in the beginning of March 1613. It seems surprising that the Abyssinian monarch should have sent these ambassadors on such a dangerous expedition without a proper guard through

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gara, the capital of another small kingdom named *Cambat*, which was at this time governed by a Moor named *Amelmal*. During the time of their residence here, one *Manquer*, a schismatic Abyssinian, arrived, who insinuated to the king that the recommendations they had brought along with them were false. This reduced them to the necessity of staying there till messengers could be sent to Socinius to know whether it was for or not; which occasioned a delay of three months. At last orders were brought to fend them off immediately. This favourable answer procured the dismissal of the ambassadors with presents; while the malicious *Manquer* was detained prisoner. He escaped, however, and overtook them in the next kingdom, named *Alaba*, which was governed by a Moor named *Aliko*. Here he accused them of a design to overturn the Mahometan religion altogether: which so exasperated the barbarian, that he threatened them all with death; and actually put them in prison, where some of the Portuguese died. At last, after holding a council in which *Manquer* gave his voice for putting them to death, it was resolved that they should be sent back to *Amelmal*; which was accordingly done, and from his dominions they returned to Abyssinia. Thus ended this memorable embassy, by which the Pope was deprived of any authentic documents which might show that any Abyssinian emperor had ever voluntarily submitted to him; and there can be no doubt that this miscarriage, more than any thing else, prevented the establishment of Popery in this country.

226
They are obliged to return.

227
A number of rebellions on account of religion.

228
The Abuna excommunicates the emperor, but is obliged to withdraw his sentence.

229
Attempts to assassinate the emperor.

Socinius had now gone so far in favour of the Catholic party, that he began to share in some measure the fate of *Za Denghel*, numberless conspiracies being formed against him; which it was undoubtedly owing only to the altered situation of affairs by the preaching and assiduity of *Peter Paez*, that he was able to withstand. The conspirators were at this time supported, not only by the *Abuna*, but by *Emana Chrilos* himself, the king's brother, whom we have frequently had occasion to mention. Their first step was the very same which had been so successfully taken by *Za Selasse* in the time of *Za Denghel*, viz. to pronounce sentence of excommunication on the emperor. He was at that time absent on an expedition against the *Agows*; but returned immediately on hearing what was transacted in his absence; informing the *Abuna*, that if he did not recall the excommunication without delay, his head should pay the forfeit. This spirited declaration had such an effect, that the *Anathema* was annulled, and the conspiracy dissolved for that time. It was next resolved between *Emana Chrilos* the king's brother, *Julius* his son-in-law, and *Kessa Wahad* master of the household, to assassinate the king in his palace. To accomplish this purpose it was concerted that they should desire an audience; that *Julius* should enter first, and present a petition of such a nature as would probably be refused: on this he was to begin an altercation; and during the continuance of it the other two assassins were to come up, and slay their sovereign before he had time to put himself in a posture of defence. Happily for Socinius, however, he was informed of his danger by a page just before *Julius* made his appearance: on which, instead of refusing the petition, he granted it immediately; so that there was no room for dispute. He then got up to walk; which was

scarce done when *Emana Chrilos* also came; on which Socinius invited them all to the terrace to walk with him. This prevented their falling upon him at that moment; and as they supposed they would have still a better opportunity on the terrace, they readily consented. But Socinius having opened a private door, at which he entered first, drew it quickly after him; and rises, as this door had a spring lock made by *Peter Paez*, which shut it in the inside but could not be opened from without, the conspirators were disappointed. Being also sensible that their design had been discovered, they were obliged for some time to keep at a distance, but did not for that reason abandon their wicked projects. Their next scheme was to be put in execution when the king was absent on an expedition against *Sennar*, who had made a violent intrusion into the Abyssinian territories. The object now was not the assassination of the emperor, but of his brother *Sela Chrilos*; because the emperor had taken the government of *Gojam* from *Emana Chrilos*, who was a schismatic, to give it to *Sela Chrilos*, who was a violent Catholic. The enterprise was begun by *Julius*; who issued a proclamation, that all those who believed two natures in Christ should leave the province of *Tigré*, where he was governor; and that such as were true friends to the Alexandrian faith should repair to his standard to fight for it. He then ordered the goods of all the Catholics in *Tigré* to be confiscated; and marched without delay into *Gojam*, in hopes to surprise *Sela Chrilos*. But here the whole scheme was baffled by the vigilance and activity of the emperor; for he having received information of what was going forward, returned into that province before the conspirators had received certain intelligence of his having left it. This so much damped the ardour of *Emana Chrilos* and *Kessa Wahad*, that they stood aloof without attempting any thing till *Julius* should try his fortune. That rebel was at first very much disconcerted; but soon recovering his courage, advanced to the place where the Nile issues out of the lake of *Dembea*, where he met with the *Abuna*. Being confirmed by that priest in his wicked designs, he resolved, by his advice, to fall upon the king before he could be joined by *Sela Chrilos*, *Simon* himself (the *Abuna*) offering to share his fortune; and to confirm all, a new and solemn excommunication was pronounced against the king and all his adherents. Socinius, alarmed at these proceedings, sent a message to *Sela Chrilos*, desiring him to come to his assistance as fast as possible. In the mean time he himself advanced to meet *Julius*; but chose his posts so judiciously, that he could not be forced to an engagement without great disadvantage on the part of the enemy. Notwithstanding this, *Julius* pitched his camp close to that of the king, with a design to force him to a battle at all events. This rash action was followed by one still worse. *Simon* had persuaded him, that as soon as the royal army should see him, they would abandon the standard of the emperor to join his. On this, without farther consideration, he rushed into the camp of Socinius with a very few attendants, and reached the emperor's tent. Here death

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230
miscar-

231
The rebellious spirit of the conspirators continues.

232
Julius the emperor's son-in-law first appears in arms.

233
Is deserted by his associates.

234
Socinius excommunicated a second time.

235
His rashness and few attendants.

camp

Ethiopia

Ethiopia.

236
Emana
Christos
taken, but
pardoned.

camp was immense, Julius having brought all his riches, which he had amassed by a long course of extortion, into the field along with him; and all of these were distributed among the soldiers. A vast number of cattle were likewise taken, which Socinios distributed among the priests, judges, and lay-officers. By this complete victory the whole scheme of the conspirators was overthrown. Emana Chrilos having no forces capable of coping with his brother, and unwilling, as we have said, to assist Julius openly, had retired to a high mountain named *Mela Amba*, in the territory of Gojam. Here he was invaded by Af Chrilos, an experienced general, whom Sela Chrilos had left governor when he joined the emperor. Emana, who was likewise an expert commander, would have made a vigorous defence; but unfortunately the mountain was so destitute of water, that in three days he was delivered up by his own men to save themselves from perishing with thirst. On being brought to the king, he was tried in a full assembly of judges, and condemned to death; but the king pardoned and sent him to Amhara.

237
Another rebellion by
Jonael.

This terrible conspiracy had been occasioned by the dispute concerning the two natures of our Saviour: another quickly followed on account of the dispute concerning the Sabbath-day; the Abyssinian church insisting on the observance of the seventh day of the week as a Sabbath, and the Romish church on the observance of the first day. The author of this rebellion was one Jonael, who had been concerned in the expedition formerly mentioned, in which the Agow's cattle were driven away, and afterwards restored by the king. It is more than probable that his resentment on this account contributed much to increase his zeal on the present occasion; but whatever was the real cause, religion was the sole pretence. He began with a most insolent but anonymous letter to the king; in which the arguments of the Alexandrians for the observance of the Jewish Sabbath were stated, and the contrary doctrine condemned with the utmost virulence of expression. The king himself was reviled in the most opprobrious manner, compared to another Dioclesian, the Jesuits said to be relations of Pontius Pilate, and all of them devoted to hell without redemption. By this stupid performance the king was so much offended, that he added a clause to the former proclamation, commanding that "all out-door work, such as plowing and sowing, should be publicly followed by the husbandman on the Saturday, under penalty of paying a web of cotton-cloth for the first omission, the value of the cloth to be 5 s.; the second offence to be punished by a confiscation of moveables, and the offence not to be pardoned for seven years." To this Socinios added a speech from the throne in vindication of himself, concerning the part he had taken in religious matters; and to show that he was in earnest, caused the tongue of a monk to be cut out for denying the two natures of Christ, and one of his generals to be whipt for observing the Jewish Sabbath.

In the mean time Jonael having collected what forces he could, openly declared against his sovereign; but not daring to meet him in the field, he retired into the country of the Galla, on hearing that Socinios was approaching him with an army. On this the king

entered their territories, and laid them waste; which created a dissention among the savages themselves; one party being for affording him protection, the other for delivering him up. This being made known to the king, he sent a few presents to the faithless barbarians of Jonael's party; who returned his kindness by sending him the head of the rebel, though but a short time before they had fought with their brethren for his rescue.

238
He is murdered by
the Galla.

A more formidable enemy than Jonael, however, still remained. The province of Damot was one of the most disaffected to Socinios in the whole empire; and to this place the greatest part of the religious fanatics in other provinces had retired. They now mustered up an army of more than 12,000 men, among whom were 400 monks, all of them armed with shields, lances, and swords; inspired, besides, with such a degree of religious enthusiasm, that they expected to be rendered invulnerable by all terrestrial weapons, and that armies of angels would fight in their cause. Against these Sela Chrilos was dispatched with about 7000 excellent soldiers; and as the general himself was a zealous Roman Catholic as well as most of his men, we need not doubt that both parties imagined themselves sure of the protection of heaven, and consequently that the encounter would be very violent. The two armies met on the 16th of October 1620; but Sela Chrilos was unwilling to destroy the infuriated people, who he knew would be unable to resist his veteran troops. He therefore first showed them his superiority in some skirmishes; and then sent a pathetic message, offering a general pardon if they would lay down their arms. The messengers, however, were not allowed to approach, so that an engagement became unavoidable. The numbers of the rebels, as Sela Chrilos had foreseen, availed very little against the discipline of the veterans he commanded. The 400 monks made a most obstinate resistance; and did not yield till after 180 of them had been killed on the spot.

Socinios, having once more vanquished his enemies, now determined to show his attachment to the church of Rome more openly. Having therefore sent for Peter Pacz, he told him his final resolution to embrace the Catholic religion in its full extent; after which he renounced the Alexandrian church in the most explicit manner. His renunciation was followed by a proclamation vindicating his conduct; in which, besides the arguments used for the Pope's supremacy, &c. he insisted much on the bad lives of the clergy of the opposite party, and for which it appeared that there was in reality too much foundation. This was the last work of the excellent missionary Peter Pacz, who died of a fever immediately after his leaving the king. The example of the sovereign, however, had very little effect upon his subjects. The proclamation was followed by a new rebellion in Amhara. Unluckily the enemies of his brother Sela Chrilos had persuaded Socinios to deprive him of his government; and there was no other in the kingdom who could be entrusted with such an important commission; so that the king soon found himself under a necessity of replacing and committing to him the charge of the war against the rebels. In this he was attended with his usual success: for the rebel chief, finding himself unable to contend with his enemy, repaired for assistance to the

239
Another rebellion.

240
Desperate
enthusiasm
of the monks.

241
The emperor publicly
renounces
the Alexandrian
faith.

242
A new rebellion
breaks out.

²⁴³ Ethiopia. Galla; who no sooner had him in their power than they killed him on the first offer of the imperial general, mangling his body in such a manner that scarce a bit of it remained to be sent to his antagonist.

The rebel chief murdered by the Galla.

²⁴⁴ A new patriarch and missionaries arrive in Abyssinia.

²⁴⁵ Socinios takes an oath of submission to the pope.

²⁴⁶ Violent conduct of Sela Christos.

²⁴⁷ And of the emperor and patriarch.

In the mean time news of the revolution in religious matters which had taken place in Abyssinia, arrived in Europe. Though the embassy to the Pope and king of Spain could not pass, as has already been related, yet frequent accounts had been otherwise transmitted; which produced such an effect, that a new set of missionaries, with a patriarch (Alphonso Mendez) at their head, were sent to Abyssinia. They arrived at Gorgora, the seat of royal residence, in the beginning of the year 1626; and at the very first audience of the emperor, it was agreed that he should take an oath of submission to the Pope. The ceremony was performed with all the splendor that could be contrived: the patriarch then preached a sermon on the Pope's supremacy in the Portuguese language, intermixed with Latin quotations; which is reported to have greatly confirmed the faith of the emperor and his brother, though neither of them understood a word of the languages in which it was preached. An answer to this unintelligible discourse was made in the Amharic language, which was equally unintelligible to the patriarch and his attendants; and to this the patriarch added a few words of a reply equally ill understood. At the conclusion of the dispute, an oath of the Pope's supremacy was taken by the emperor himself on his knees, then by the princes, and afterwards by all present, according to their different stations. Sela Christos, not contented with taking the oath, drew his sword, and in words not easily understood, denounced vengeance on "those who fell from their duty;" and he likewise added to the oath of supremacy another to the emperor and Facildas the Prince Royal; but if the latter should fail in the defence of the Catholic faith, he swore to be his greatest enemy; nor would he be satisfied without imposing this clause upon all the officers, whether civil or military, then present.

This violent conduct of Sela Christos procured him a number of enemies, and at last was the occasion of his destruction; but that of the king and patriarch set the whole empire in a flame. An excommunication was first pronounced upon all who did not keep the oath: a proclamation was next issued, that all priests should previously embrace the catholic religion under pain of death; and that every one, under the same penalty, should observe Lent and Easter according to the rules of the Romish church. The patriarch proceeded in the same style; re-ordinating the clergy, consecrating the churches over again, rebaptizing the people, even such as were full-grown, abrogating circumcision, polygamy, and divorce (for these had been allowed by the Alexandrian church), and reducing the moveable feasts entirely to the rules of the church of Rome.

Though polygamy and divorce are no doubt inconsistent with the pure doctrines of the gospel, yet it was very improper to meddle with these practices at once in such a violent manner. Besides the confusion that this would naturally occasion in private families, these practices gave occasion to many questions in law, which it belonged to the civil judges to decide; but now these were all subjected to the authority of the

patriarch: and from some other steps taken by this prelate, it appeared that he intended to encroach much farther upon the civil authority. One of these related to the church-lands; which in Ethiopia are granted by the king, and resumed at his pleasure; others being granted in their place, so that neither priests nor monks have any property in them. On the present occasion, an Abyssinian nobleman had possessed some lands belonging to a catholic monk; for which he was called before the patriarch. On his refusing to submit to this new tribunal, he was instantly condemned to restore the lands; but refusing this also, the patriarch took an opportunity, as he was attending the emperor at church, to pronounce sentence of excommunication against him, giving him over at once, soul and body, to the devil.—On hearing this terrible sentence pronounced, the nobleman fainted away, and was with difficulty recovered. On the intercession of the emperor, however, the curse was taken off; but the incident produced a very disagreeable effect on the minds of the people, who from that day began to entertain a greater aversion than ever to the Roman Catholics and their priests. This aversion was greatly increased by the absurd conduct of the patriarch, in ordering the body of an Abyssinian saint to be taken up, and thrown out of the grave in an ignominious manner, because it had been buried under the altar of a church, which he imagined was thus defiled. In all other respects, the patriarch behaved in such an insolent and overbearing manner, that the effects of his oppression soon began to be universally felt, and the Catholic religion began very quickly to decline.—The first stroke given to it was the alteration of the liturgy; which was done at the desire of the emperor. Ever since the establishment of the Catholic religion, the Latin mass-book, &c. had been made use of according to the practice of the church of Rome; but as it seemed very unreasonable to impose this at once upon the Ethiopians, Socinios ordered the patriarch to make such alterations in the old Abyssinian liturgies as he thought proper, that the people might thus have an opportunity of paying their devotions in a language they understood. The patriarch, not being able to assign any solid reason to the contrary, was obliged to comply; but no sooner was this done than the people made use of their old liturgies entirely, without the least regard to the innovations of the patriarch. In the midst of the confusion which daily took place from these causes, the Galla made a dreadful invasion, and cut off one of the emperor's generals with his whole army: nor were all the abilities of Sela Christos, who had to often distinguished himself, sufficient to retrieve matters; so that the savages, after having ravaged the country for some time at pleasure, returned home loaded with booty. This misfortune was followed by the revolt of Tecla Georgis the king's son-in-law; who not only made religion the pretence for taking up arms, but insulted the Catholics in the most outrageous manner; collecting their images and other religious trinkets into an heap, and then publicly setting fire to them. After this he called before him his own chaplain, named *Abbe Jacob*, who was a Catholic, stripped him of his pontificals, and killed him with his own hand. A reconciliation with Socinios was now impossible; so that he had no resource but in arms. In

Ethiopia.

²⁴⁸ An Abyssinian nobleman excommunicated.

²⁴⁹ Body of an Abyssinian saint thrown out of the grave.

²⁵⁰ Catholic liturgy altered.

²⁵¹ An army cut off by the Galla.

²⁵² Tecla Georgis, the king's son-in-law, revolts.

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cuted.

this, however, he was equally unsuccessful with the other rebels in this reign; being defeated, taken prisoner, and put to death along with his sister Abdera, notwithstanding the intercession of a Catholic missionary for him, and that of the queen and ladies of the court for his sister.

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Agows,
o set up
elcha
Christos.

As the reasons given by the king for refusing such powerful intercession were purely religious, the people became more and more averse to a profession so extremely oppressive and sanguinary as that of Rome seemed to be. A revolt of the Agows quickly followed; not that religion had really any share in their determinations, but that they were exasperated by the slavery and oppression to which they saw themselves subjected. They now therefore set up Melcha Christos, a prince of the royal blood, as a pretender to the crown; and soon put on such a formidable appearance, that the king himself thought proper to march against them with an army of 30,000 fighting men, which with the servants and other attendants amounted to more than 80,000. Melcha Christos retired with his troops to the craggy mountains of the country; and being imprudently followed by the emperor, rolled down such quantities of stones from the precipices, that Socinios was obliged to retreat with great precipitation, after having lost almost one half of his army.

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Sela Chri-
stos.
256
Sela Ma-
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On this defeat the emperor found himself obliged to apply to Sela Christos, whom he had again disgraced and deprived of his government. He succeeded in giving the rebels a dreadful overthrow, which for some time entirely broke their power; but this success was quickly followed by the revolt of Læca Mariam, a near relation of the king. He also was defeated, and obliged to retire to a mountain so steep, that though he ascended it in safety, he was dashed in pieces with many of his followers in attempting to descend; the rest, who escaped this danger, being killed by their pursuers. Still, however, the rebel Melcha Christos was unsubdued; against whom Prince Facilidas, the heir apparent to the throne, was sent, having under him a nobleman of most distinguished character named *Kela Christos*. The latter was defeated and killed, without its being in the power of Facilidas to do any thing towards the suppression of the rebellion. This misfortune was followed by the death of *Pecur Egzie*, formerly ambassador with Antonio Fernandes to the pope, but now lieutenant-general to Sela Christos. He was cut off with a small body of troops by the Galla; and from many misfortunes befalling the imperial troops, the power of Melcha Christos was augmented to such a degree, that he now began to act as a king, and appointed a deputy governor to one of the provinces. His opinion of his own importance, however, had almost proved his ruin; for the new governor having appointed a great festival on a Saturday, in opposition to the royal edict, he was attacked by a party of the king's troops, and entirely routed with the loss of 4000 of his men. This defeat was revenged by an overthrow given to Prince Facilidas himself; the blame of which was laid upon Sela Christos. The latter, as we have often had occasion to observe, was not only a most valiant commander, but a rigid Catholic; and these two properties might naturally have been thought to secure him in favour with the emperor. His violent conduct in regard to

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misfortunes
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emperor.258
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fated.259
Prince Fa-
cildas de-
fated.

the Catholic religion, however, had raised him so many enemies, that accusations were perpetually brought against him; and one disgrace constantly followed another, notwithstanding all his services. The present accusation was brought by one Lefana Christos, whom Sela Christos had formerly condemned to death. For this offence he had received a pardon from Socinios; and he now revenged himself upon his former judge by accusing him to his sovereign. Sela Christos was not unmindful of this conduct; and therefore, as soon as he had him in his power, put him to death without regarding the pardon he had received. The emperor on this deprived him of the government of Gojam, which he gave to Serca Christos, who was supposed to be a dependent on Prince Facilidas, and was besides cousin to the emperor himself. The new governor, on his entering upon office, promised solemnly to support the Catholic religion; but no sooner did he arrive in Gojam, than he solicited Prince Facilidas to rebel against his father, and re-establish the Alexandrian faith. This was not the only instance in which he showed his disobedience. He had received the charge of a caravan which came annually from Nærea; but instead of acting properly in this respect, he employed himself in driving off the cattle of the Agows and Damots, who expected no harm, and were consequently quite unprepared. Such numbers of them were carried off on this occasion, that 100,000 are said to have been sent to the Abyssinian market. Socinios, when informed of such an atrocious robbery, ordered him to restore the cattle, and to surrender himself prisoner; but instead of complying with this order, he again solicited Facilidas to revolt against his father. For this he was sharply reproved; but now, determining to make the world believe that the prince had entered into his schemes, he sent a public message to him, in which he was desired to come and take possession of the kingdom. Facilidas imprisoned the person who brought this treasonable message, and soon after sent him to Socinios; but Sela Christos still persisted in his mad attempts. He now proposed to abolish the Romish religion throughout the kingdom; and with that view attacked a convent which Sela Christos had built in Gojam; but the fathers having been furnished with some fire-arms, made so good a defence, that he was obliged to give over the enterprize. He then took the last step to complete his folly, by openly revolting against the emperor, and setting up a prince of the blood-royal in opposition to him, whom he had found living in obscurity among his mother's relations. To cut off all possibility of reconciliation with the emperor, he renewed the sacrilegious practices of Georgis, and put to death a priest for refusing to deny the two natures of Christ. Thus he procured a multitude of enthusiasts to join him; but when the affair came to a decision, and Prince Facilidas with a well disciplined army was sent again him, it then became evident how little the fanaticism of a tumultuous rabble availed against the skill of a regular army. The rebels fought, however, with great obliquity till most of them were killed, their commander being obliged to take refuge on a mountain; from whence being unable to make his escape, he at last came down, and surrendered at discretion. We need not doubt of his fate; but notwithstanding the execution of this

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Sela Chri-
stos a univer-
sally hated.261
Deprived
of the go-
vernment
of Gojam.262
Revolt of
the new go-
vernment.263
He is de-
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turally, and
of his fate.

Ethiopia.

rebel, another still remained. This was Melcha Christos, against whom the emperor next prepared to march. He now found, however, the bad consequences of having acted so violently in favour of the Catholic religion. His army was so disaffected, that he could scarcely put any confidence in them. For this reason he issued a proclamation, that such as chose to observe the Wednesday as a fast instead of Saturday, had liberty to do so. This and some other indulgencies being reported to the patriarch, the latter sharply reproved him as committing an encroachment on the priesthood; and put him in mind of the punishment of leprosy inflicted upon Uzziath for assuming the priest's office. Thus an altercation commenced; and it was evident, from the behaviour of Socinius, that his extreme favour for the Romish religion began to decline. After this he set out for the country of Lafta, where Melcha Christos was; and the entrance to which was guarded by very high and rugged mountains. Among these the rebels had strongly fortified themselves; and were driven from four posts by the king's troops, so that the latter imagined a complete victory had been gained. Ascending themselves, however, on the top of another high mountain, the rebels watched their opportunity; and defending suddenly upon them, cut off great numbers, and obliged the rest to make a precipitate retreat. Another campaign was therefore necessary; but now the army lost all patience. They were become weary of making war on their countrymen; and, after slaughtering them in the field, seeing the intervals between the campaigns filled up with numerous executions of those who had escaped the sword. A deputation was therefore sent from the soldiers by Prince Facilidas, who, though he had never declared his sentiments openly, was strongly suspected of being no friend to the Catholics. The purport of the deputation was, that they did not mean to say that the Romish profession was a bad one, but it was such as they could not understand; and consequently there could be no merit on their part in professing it. They were ready, however, to lay down their lives for the public good, provided their ancient religion was restored; but this was a point they would not give up, and without which they would neither concern themselves in the quarrel, nor even with success to the emperor's arms. With regard to the Romish religion, they added this declaration, perhaps the strongest possible mark of aversion, that they did not wish to know any thing about it. Socinius, therefore, according to the Abyssinian accounts, promised to restore the Alexandrian faith, on condition that he returned victorious from Lafta. The army then readily agreed to follow him wherever he pleased; while the rebels, having left their fortresses in Lafta, probably from a confidence in their own strength, boldly marched towards the royal army. In the engagement, however, they did not show their usual alacrity, and were soon defeated with the loss of 8000 men. Many of their best officers were killed on the spot, and Melcha Christos himself escaped only by the swiftness of his horse.

By this victory the power of the rebels was broken; but it was not attended with the same satisfaction to the people with which other victories were wont to be accompanied. On viewing the field of battle along

with Facilidas next day, the prince is said to have made a pathetic speech to his father; in which he told him, that the bodies of the men he saw dead on the field of battle were neither those of Pagans nor Mohammedans, but of his own Christian subjects; and that victories, such as these were like driving a sword into his own entrails. "How many men (says he) have you slaughtered? how many more have you yet to kill? We are become a proverb even to the Pagans and Moors for carrying on this war; and for apostatizing, as they say, from the faith of our ancestors." The king did not make any reply at that time; but the effects of the prince's words were soon apparent. The patriarch took the first opportunity of upbraiding him with his ingratitude to the Catholics, and deserting the religion whose professors had by their prayers obtained such a signal victory. To this Socinius replied in general, that he had done every thing in his power to establish the Catholic religion; for which he had shed the blood of thousands, and had still as much more to shed: but that he should consider of the matter, and acquaint him with his final resolution. This was by no means favourable; for next day, in a message to the patriarch, he recounted the many rebellions which had been excited on account of religion; and concluded with telling him, that though the faith of Rome was not a bad one, yet the people of Abyssinia did not understand it. For this reason he was determined to grant a toleration, by allowing such as professed the Catholic faith to do so in peace, and such as rather chose that of Alexandria to do the same. The patriarch replied, that he had no objection to grant this indulgence to such the patriarch as had not yet embraced the Catholic faith; but those arch who had done so could not be permitted to renounce it without a grievous sin. Thus a new system of persecution would have commenced: but the emperor, understanding well the purport of his discourse, replied, that if this was the case, he was no longer master of his own kingdom; and immediately afterwards issued a proclamation, wherein he declared the Alexandrian faith restored, with the altars for the sacrament, liturgy, and every other thing belonging to it; at the same time, that being now old and infirm, he himself resigned the crown and empire to Facilidas.

This remarkable proclamation was made on the 14th of June 1632; after which Socinius took no farther care of public affairs, nor did he long survive this transaction. He died on the 7th of September this year, and with him fell all the hopes of the Jesuits. Facilidas, as had been rightly conjectured, was an inveterate enemy to the Catholic faith. As soon therefore as he had obtained the government, even before he took upon himself the title of king, the Catholics were to every where displaced from offices of trust and honour; but as soon as he found himself established on the throne, a letter was sent to the patriarch, informing him, that as the Alexandrian faith was now restored, it was become indispensably necessary for him to leave arch the kingdom, especially as the new Abuna was on the way, and only deferred his journey till the Romish priests should be out of the country. For this reason he commanded the patriarch, with all his brethren, to leave their convents throughout the empire, and retire to Fremona in the kingdom of Tigré, there to wait his further pleasure. The patriarch attempted to soft-

264
The emperor relates in his fore-
rity con-
cerning re-
ligion,
which is re-
served by the patri-
arch.

265
The emperor
s defeat-
ed.

266
The army
require the
restoration
of the Alex-
andrian
faith.

267
Melcha
Christos de-
spaired.

Ethiopia.
268
Patriarch
speech of
prince Fa-
cilidas to
his father
concerning
the war.
269
Travel.

269
An univer-
sal tolera-
tion grant-

270
Opposed by
the patri-

271
The emperor
restores
the Alex-
andrian
faith, and
reigns the
kingdom.

272
The new
emperor
an enemy
to the Ro-
mans.

273
The patri-
arch com-
manded to
quit Abys-
sina.

en him by many concessions, but in vain; on the 9th of March 1633 he was ordered, with the rest of the fathers, to proceed immediately for Fremona. This they were obliged to comply with; but the emperor, understanding that they were about to establish themselves, and to solicit succours from Spain to accomplish their purposes by force, he sent orders to the patriarch instantly to deliver up all the gun-powder they had at that place, and to prepare without delay to set out for Masuah. Still the infuriated and obdurate priest determined not to comply with the emperor's orders. At last he thought proper to deliver up the gun-powder; but refused to leave his companions behind him, and to disperse them as much as possible through the empire, in case he himself should be obliged to embark at Masuah; which, however, he did not by any means intend. For this purpose he applied to the Baharnagalli, named *John Akay*, then in rebellion against the emperor; who carried them all off from Fremona in the night-time, under a guard of soldiers, and lodged them safely in a strong fortress named *Adicotta*. Here the patriarch imagined that he might remain in safety till he should be able to procure succours from India. In this, however, he was deceived. John conveyed them from place to place, through many unwholesome situations, till their strength as well as their patience was exhausted. At last, on receiving a present of gold, he allowed them to return to their old habitation *Adicotta*. Facilidas, then, being determined at all events to get rid of such troublesome guests, endeavoured to prevail upon John by bribes to deliver them into his hands. John was too delicate to comply with this request, which he supposed would be a violation of hospitality; but he consented, on receiving a proper compensation, to sell them to the Turks. Two were left in Abyssinia, in hopes of soon sharing the crown of martyrdom; and this indeed Facilidas did not delay to put them in possession of, both being ordered for execution as soon as he got them into his power. Not content with this, and being perpetually apprehensive of fresh invasions from Europe, he entered into a treaty with the Turkish bashaws to keep the ports of Masuah and Suakem shut against them; by which their entrance into Abyssinia would be effectually prevented.

During these transactions, the emperor took the most effectual methods otherwise to eradicate the Romish religion, by cutting off the principal persons who professed it, or obliging them to renounce their profession. The principal of these was his uncle *Sela Christos*, who had deserved so well of the late emperor *Socinios*, and of the whole empire in general. His excessive bigotry in religious matters proved the cause of his destruction, as has formerly been hinted. When it was proposed to him to renounce his faith, he absolutely refused to do so, either to avoid the greatest punishment the king could inflict, or to obtain the greatest gift he had in his power to bestow. On this he was banished to an unwholesome district among the mountains of Samen; but as even here he kept up a correspondence with the Jesuits, and wished to facilitate the introduction of more Portuguese from India, he was sentenced to be hanged on a cedar-tree.

The expulsion of the present race of missionaries did not entirely discourage the Europeans from attempting

to introduce a fresh mission into Abyssinia. The obstinate, haughty, and rebellious spirit of the Jesuits was universally condemned, and looked upon to be the cause of the extreme aversion shewed by the emperor and the whole empire against the doctrines they professed. It was therefore hoped, and not without some appearance of reason, that the point might still be gained, provided the mission were undertaken by others less violent and insidious in their behaviour. After the execution of those who remained in Abyssinia, six Capuchins, the reformed order of St Francis, were sent with protections from the Grand Signior to facilitate their passage into Abyssinia, where they hoped to revive the drooping or rather lost cause of the Catholic religion. Nothing, however, could be more unfortunate than the event of this undertaking. The Galla murdered two who attempted to enter Abyssinia by the way of Magadoxa. Two who arrived safely in the country, were stoned to death; while the remaining two, hearing of the fate of their companions, returned home with an account of it. The bad success of these did not deter three others from making the same attempt a short time afterwards; but they having imprudently informed Facilidas of their intention, were murdered by the bashaw of Masuah, who had received orders from him to this purpose. So particular was the emperor with regard to the execution of this order, that he caused the bashaw to send him the skin of their faces and heads; that he might know by their faces that they were Europeans, and by their shaved heads that they were priests.

Though the Catholic faith was now totally suppressed, the spirit of rebellion still continued; and Melca Christos continued as much in opposition to his sovereign as when he first took up arms on pretence of religion. At first he met with extraordinary success; totally defeated the royal army, though commanded by Facilidas in person; after which, pursuing his good fortune, he made himself master of the capital, entered the palace, and was formally crowned king. This, however, was the last of his good fortune. Facilidas having recruited his army as fast as possible, sent three able generals to attack his rival, who was now acting the sovereign in his place. The rebels were surrounded before they expected any enemy, and almost entirely cut off, Melca Christos himself being killed in the engagement.

The victory over Melca Christos was followed by several successful expeditions against the Agows and Galla; but in the 6th year of the reign of this emperor, the rebels of Lafta, who seemed determined not to yield while there remained a possibility of resistance, chose the son of Melca Christos for their king, and again began their depredations on the neighbouring provinces. Facilidas marched against them with his usual activity; but had the misfortune to lose the greatest part of his army by cold among the mountains of Lafta, though it was then the time of the equinox, and consequently the sun was only 12° from being perpendicular, the latitude of Lafta being no more than 12°, with cold and the sun 12 hours in the day above the horizon.

Before this rebellion could be suppressed, another was begun, at the head of which was Claudius the king's brother. He had not the same good fortune with the rebels of Lafta; but was quickly defeated, taken prisoner,

Ethiopia.

277
A new mission undertaken by six Franciscan Capuchins.

278
Four of them murdered, and the other two return.

279
Three others murdered by order of Facilidas.

280
Melca Christos still continues in rebellion.

281
Is defeated and killed.

282
The rebels choose him for their king.

283
The emperor's army

Ethiopia.

284
Princes of
the blood
again im-
prisoned on
a moun-
tain.

285
Facilidas
defeated by
the Agows
and Shan-
galla.

286
The rebels
of Lafta
fubmit.

287
Reign of
Hannes.

288
Reign of
Yafous.

289
His gener-
ofy to the
banifhed
princes.

soner, and banished to a mountain called *Wechne*, which served from that time for the imprisonment of the princes of the blood-royal. The fuppreffion of one rebellion, however, feemed to have no other effect than that of giving rife to another. A new expedition was to be undertaken againft the Agows and Shangalla; but they had poffed themselves fo advantageoufly, that the royal army was entirely defeated without being able to make any impreffion on their enemies. Facilidas, however, knowing that this defeat could be attended with no other bad confequence than the loss of the men, which had already happened, marched direftly againft the rebels of Lafta without attempting to revenge the defeat he had fufained. The rebel general, weary of contention, in which he probably faw that he would be finally unfeceffful, clofe to fubmit unconditionally to the emperor; who, though he at firft affected to treat him with feverity, foon after releafed him from prifon, beftowing upon him large poffeffions in Begemder, with his daughter Theoclea in marriage.

Facilidas died in the month of October 1665, and was fucceeded by his fon Hannes. This prince was fuch an enthuft for Chriftianity, that in the very beginning of his reign he iffued a proclamation forbidding the Mahometans to eat any flefh but what was killed by Chriftians; but fo far was he from any inclination to favour the Catholics, that he ordered all their books which could be found in the empire, to be collected in a heap and burnt. Much of his time was fpent in regulations of church-matters, and in contentions and trifling difputes with the clergy; which conduct fo difgufted his fon Yafous, that he fled twice from the capital, but was purfued and brought back. The laft time was in the year 1680, when he found his father ill of the diftemper of which he died. Hannes expired on the 19th of July that year, having lived at peace during the whole of his reign, excepting fome trifling expeditions againft the Shangalla and rebels of Lafta.

Yafous, who fucceeded to the throne with the approbation of the whole kingdom, was of a very different difpofition from his father; being generous, active, and brave to a great degree; he was alfo much lefs bigoted, and differed from him confiderably in religious principles. Having fettled church-matters as he thought proper, his next ftep, and the moft glorious action of his whole reign, was to pay a vifit to thofe of the royal family who were confined on the mountain of Wachne. He found them in the moft miserable condition; all in tatters, and many almoft naked; their revenue having been ill paid by his father, who was of a fordid difpofition, and the little they received having been embezzled by their keepers. Yafous being greatly moved at this fpectacle, ordered a large fum of money to be divided among them for their prefent neceffities, clothed them according to their rank, and fettled matters fo that no part of their revenue could ever afterwards be applied to improper purpofes. To the governor of the mountain he affigned a large tract of territory, to make amends for the profit he had been accuftomed to derive from the revenue of the princes; and finally, he left all the prifoners at the foot of the mountain, at perfect liberty either to take up their refidence again on it or any where elfe. By thefe extraordinary inftances of royal munificence the emperor fo effectually gained the af-

fection of his relations, that they univerfally determined to return to their former ftate of confinement; and during the whole time of his reign no competitor for the crown ever made his appearance from among thofe who refided there.

Though Yafous is faid to have poffeffed all the qualities which conftitute a great and good monarch, the natural turbulence of his fubjects, and the peftilent difpofition of the monks, foon began to fhew themfelves by new feditions. Thefe were preceded by a violent irruption of the Galla, who were overthrown, as ufual, with great flaughter; but foon after, being foli-cited by fome monks who had drawn over a party of the Agows to their fide, the difturbances were renewed. A grandfon of Socinios, who had fled to the Galla when Facilidas firft banifhed the princes to Wechne, was proclaimed king. A multitude of favages immediately flockd to his ftandard, fo that he was foon at the head of a very formidable army, while the Agows and other malecontents were ready to join him as foon as he fhould repafs the Nile. The king, however, entirely difconcerted the fcheme by his activity; for, advancing with the utmoft celerity, he reached the banks of the Nile before the Galla on the other fide were ready to join their allies on this fide of it. The Agows were fo confounded at his prefence, that they allowed him to pafs the river unmolefted. The Galla were equally furprifed at feeing the war transferred into their own country; and, with their ufual ficklenefs, deferted the prince whole caufe they had pretended to epoufe. A few remained faithful, but were utterly defeated by the forces of Yafous; the unhappy prince himfelf, whofe name was *Ifaac*, being taken prifoner, and put to death in the prefence of his rival. After this many great exploits were performed againft the rebellious Agows, Galla, and other favages; but which, as they produced no other confequence than that of eftablifhing the emperor's character for valour and fkill in military affairs, we fhall here pafs over; only remarking, that, in the opinion of his fubjects, one of his campaigns was the moft glorious ever recorded in the annals of Abyffinia. The moft memorable events in the prefent reign regarded religion, and a renewal of the correffpondence betwixt Europe and Abyffinia; of which we have a particular account from Mr Bruce to the following purpofe. About the end of the 17th century a number of Francifcans from Italy fettled at Cairo in Egypt, and were maintained at the expence of the fathers in Paleftine, though pretending to be independent of their fuperior the guardian of Jerufalem. The latter, difpleafed at this method of proceeding, offered to fupply the miffion to Egypt entirely at the expence of Paleftine, and likewife to furnifh from thence miffionaries capable of inftructing the people in the Chriftian religion. This offer meeting with a favourable reception at Rome, a new fet of miffionaries from Jerufalem, called by our author *Capuchins*, appeared at Cairo; from whence the Francifcans were banifhed, only two of them being allowed to remain in that city. The others returned to Rome; where, finding that they could not re-eftablifh themfelves by fair means, they had recourfe to artifice and fcdion. It was now pretended, that, on the expulffion of the Jefuits from Abyffinia, a great number of Catholic Chriftians had fled into the neigh-

Ethiopia.

290
Irruption
of the Gal-
la, feditions
of the
monks, re-
bellion, &c.

291
Quelle t
by the em-
peror.

293
Attempts
to revive
the religi-
ous miffion
from Eu-
rope.

bouring

Ethiopia.

bouring countries of Nubia and Sennsar, where they found themselves so grievously oppressed by the Mahometans, that, without some spiritual assistance, they would be under the necessity of renouncing their religion. This story being confirmed by the two Franciscans who remained at Cairo, the cause of these supposed Christians was eagerly espoused by the religious in Italy, and a new mission set on foot at the expence of the pope for their relief, which continues to this day under the title of the *Ethiopic mission*. The missionaries had it also in charge to penetrate if possible into Abyssinia; and to keep up, as far as was in their power, the Catholic faith, until a better opportunity should offer of making an attempt to convert the whole empire. For this purpose a convent was procured for them at Achmim in Upper Egypt; and permission was granted, notwithstanding their former banishment, to settle two of their order at Cairo independent of the fathers of Palestine.

While these transactions passed in Italy and Egypt, Louis XIV. of France was in the height of his glory. He had attempted to rival the ancient Greeks and Romans in the magnificence of his works; but his conduct with regard to religion, his persecution of the Protestants, and revocation of the edict of Nantz, had disgratized him throughout the greatest part of Europe as a bloody and merciless tyrant. To wipe off this stain, the Jesuits, his great spiritual directors, formed a scheme of inducing the emperor of Abyssinia to send an embassy to France; after which they hoped that they might get themselves replaced in the *Ethiopic mission*, to the exclusion of the Franciscans. The king, whose pride was very much flattered by the proposal, readily came into it; but the Pope's consent was still necessary. His Holiness was by no means pleased with this intrusion of a temporal prince into spiritual affairs: nevertheless, he did not choose to enter into any contest; but that he might undo with one hand what he did with the other, he appointed six Jesuits, of whom Verseau, the ambassador of Louis to himself, was one, to be missionaries to Abyssinia, but the superior of the Franciscans to be his legate *à latere* at that court; providing him with suitable presents for the emperor and principal nobility.

The Jesuits now finding themselves in danger of being supplanted by the Franciscans, applied to the Pope to know which of the two orders should make the first attempt to enter Abyssinia; but received no other answer than that those who were most expert should do so. Verseau, probably displeased at this conduct of the Pope, went to a convent in Syria of which he was superior, without making any attempt to enter Ethiopia: therefore the mission remained in the hands of two persons of opposite professions, a Jesuit and Franciscan; the name of the latter being *Paschal*, an Italian; and of the former *Brevedent*, a Frenchman. The latter was accounted a man of learning and probity, zealous in the cause of his religion, but by no means imprudent or rash in his attempts to promote it.

In the mean time an unforeseen accident procured admittance to the missionaries into Abyssinia more readily than could have been expected in the present situation of affairs. Yafous and his son had both been attacked by a scorbutic disorder which threatened to

turn to a leprosy; on which one Hagi Ali, a Mahometan factor at Cairo, received orders to bring with him an European physician on his return to Abyssinia. It happened that this man had formerly been acquainted with Friar Paschal, who had administered some medicines to him. He now proposed that Paschal should accompany him to Abyssinia in the character of a physician; and that Friar Anthony, another of his own order, should go with him as his companion. But this scheme was frustrated by Maillet the French consul, who had the charge of the whole from Louis XIV. and wished that the Jesuits alone should have the conduct of the mission. For this purpose he represented to Hagi Ali, that friar Paschal understood nothing of medicine; but he promised to furnish him with another, whose skill he extolled above all those of ancient or modern times. Hagi Ali, who knew nothing of the matter, readily agreed to Maillet's proposal; and Charles Poncet a Frenchman, who had been bred a chemist and apothecary, was appointed to the office of physician, with Father Brevedent to attend him as his servant. Thus the scheme of the Franciscans was for the present overthrown: but unluckily Maillet employed one Ibrahim Hanna, a Syrian, to write letters to the Abyssinian monarch and some of his principal nobility, which he desired him to submit to the inspection of one Francis a capuchin or monk of the Holy Land, and consequently an enemy to the Franciscans. Ibrahim, not being acquainted with the monk he mentioned, and thinking any other would answer as well, carried the letters to one of the same name, but of the Franciscan order. Thus the whole secret was divulged at once; and the Franciscans, with the malevolence essential to such religious miscreants, resolved on the destruction of Poncet and his attendants. At present, however, their sanguinary intentions were defeated; Poncet set out immediately after he had received his commission, and arrived safe at Gondar the capital of Abyssinia, with his attendant Father Brevedent, on the 21st of July 1699. Brevedent died on the 9th of August; but Poncet lived to execute his commission, by making a full cure of his royal patient. On the 2d of May 1700, he set out on his return for Europe, and arrived at Mafuah without any bad accident.

It has already been observed, that the main end of this undertaking was to procure an embassy from Abyssinia to the French monarch; and this end also was gained. An ambassador was procured, but unluckily not such a one as M. Maillet the chief manager of the whole project desired. This man, intoxicated with absurd notions of nobility and distinctions of rank, could not make allowance for the difference between the appearance of an ambassador from a barbarous monarch, however powerful, and one from the sovereign of a civilized and polite nation. The ambassador sent by Yafous, therefore, having been originally no other than a cook, could not be agreeable to a man of such a disposition. The presents sent by the Abyssinian monarch indeed, had they arrived, would have probably conciliated matters. These were, an elephant, some Abyssinian young women, &c. but unluckily the elephant died, and the ambassador was robbed of all the rest by a Turkish bashaw. Maillet, therefore, naturally proud, imperious, and covetous, thought pro-

Ethiopia.

294
Friar Paschal and another Franciscan undertake the office.

295
Disappointed by M. Maillet.

296
Poncet and Brevedent appointed.

297
The Franciscans resolved on the destruction of the missionaries.

298
Poncet sets out on his return after curing Yafous.

299
The Abyssinian ambassador disagreeable to M. Maillet.

293
Yafous falls sick, and sends for an European physician.

Ethiopia

300
He is not
allowed to
proceed to
France.

per to call in question the authenticity of Morat the ambassador's mission, to call Poncet himself a liar, and not to allow the former to proceed to France. The transactions on this occasion are set forth at length by Mr Bruce, greatly to the disgrace of Maillet; but as details of this kind would swell the present article beyond due bounds, we must refer the curious reader to the work just mentioned.

301
M. de Roule
sent am-
bassador
from
France.

Thus the scheme of procuring an embassy from Abyssinia having proved abortive, the next project of the Jesuits was to get an embassy sent from France, whose object was to be the cementing a perpetual peace betwixt the two nations, and to establish a lasting and commercial intercourse; though, whatever friendship or good-will might take place, it was evident that there was not a single article that could be exchanged between them, nor was there any ready communication betwixt the two countries either by sea or land. The person pitched upon as ambassador was M. de Roule, vice-consul at Damietta. He is characterized by Mr Bruce as "a young man of some merit, who had a considerable degree of ambition, and a moderate skill of the common languages spoken in the east; but absolutely ignorant of that of the country to which he was going, and, what was worse, of the customs and prejudices of the nations through which he was to pass. Like most of his countrymen, he had a violent predilection for the dress, carriage, and manners of France, and a hearty contempt for those of all other nations: this he had not address enough to disguise; and this endangered his life." Besides these disadvantages, he had the misfortune to be under the displeasure of all those of his own nation who resided at Cairo: so that the merchants were very much averse to his embassy; and, as the Franciscans and Capuchins were his mortal enemies, he had not a single friend in the world except Maillet and the Jesuits. Unluckily the consul mistook him in one of the most material articles, and which was undoubtedly of the utmost consequence to him in the accomplishment of his purpose, viz. the presents necessary to be taken with him for the barbarous people through whose country he was to pass. Brocades, fattins, and trinkets of various kinds, according to Mr Bruce, were the proper wares; but, instead of this, he had taken along with him mirrors of various kinds, with the pictures of the king and queen of France, wearing crowns upon their heads. The former of these subjected him to the imputation of being a magician; while the latter, if shown to a Mahometan, would bring upon him the charge of idolatry. The worst misfortune of all was the malice and treachery of the Franciscans, who had already prejudiced against him the people of the caravan with whom he was to go, the governors of the provinces through which his road lay, and the brutal and barbarous inhabitants of Sennaar, who lie in the way betwixt Egypt and Abyssinia. The consequence of all this was, that he was murdered at the last mentioned place with all his retinue. The Franciscan friars, who had preceded him to Sennaar, left it before his arrival, and returned immediately after. There cannot therefore be the least doubt that they were the authors of his murder; though the bigotted disposition of Louis XIV. prevented all enquiry into the matter; so that the parti-

cular steps they took to accomplish their designs were never published to the world.

303
Yasouf as-
saffinated.

The assassination of de Roule was preceded by that of Yasouf emperor of Abyssinia, who fell by a conspiracy of his wife and son, occasioned by a fit of jealousy in the former. He was succeeded by his son Tecla Haimanout, who had conspired against him. Before his death, he had dispatched a messenger to the king of Sennaar, requiring him to afford M. de Roule protection at his court, and a safe conduct from it; but when the messenger was within three days journey of the capital of that kingdom, he received news of the assassination of Yasouf. On this he returned in great haste to Gondar, in order to have the letters of protection renewed by Tecla Haimanout the reigning prince. This was readily done: but before the messenger could reach Sennaar, he was informed that de Roule was already assassinated; on which he returned with still greater haste than before. The Abyssinian monarch, provoked at such a scandalous violation of the law of nations, declared his intention of commencing hostilities against the king of Sennaar; and for this purpose assembled his army. But this was scarce done, before he was informed that a rival, named Amda Sion, had been set up against him by the friends of his father Yasouf, and had been for some time privately collecting troops to surprize him before he could be ready to make any opposition. It was therefore necessary to employ the army destined against Sennaar to reduce this rebel to obedience; and scarce was this done, when the emperor himself was assassinated; so that all thoughts of revenging the death of M. Roule were laid aside.

304
The new
emperor in-
tends to re-
venge his
death;

Tecla Haimanout perished in 1706, and was succeeded by his uncle Tifisili, or Theophilus; whose first care was to apprehend all those suspected to have been concerned in the death of his predecessor. Thus the murderers of Yasouf, whom Tecla Haimanout had instigated, imagined themselves secure, and came to court without any fear of danger: but no sooner did Theophilus get them into his power, than he caused them all to be put to death without exception; the queen herself being publicly hanged on a tree. Not satisfied with avenging the death of Yasouf by the execution of his murderers, he did the same with those queen and of Tecla Haimanout; putting to death all who were immediately in his own power, and commanding the governors of the provinces to do the same with those whom they could find within their jurisdiction. One of these named Tigi, who had been formerly betwixt, having escaped into the country of the Galla, raised a very considerable army, with which he invaded Abyssinia, where he committed the most dreadful cruelties. Theophilus engaged him on the 28th of March 1709; when, with a force greatly inferior, he gained a complete victory. A number of the Galla fled to a church, hoping to be protected by the sanctity of the place; but the emperor telling his soldiers that it was desired by those who were in it, commanded it to be set on fire, so that every one perished. Tigi, with his two sons, were taken prisoners, and put to death. The king himself did not long survive his victory; falling sick of a fever, of which he died in September 1709.

305
But is him-
self mur-
dered.

306
Reign of
Theophi-
lus.

307
Execution
of the
other regi-
cides.

308
Tigi revolts
but is de-
tained, ta-
ken and put
to death.

302
He is mur-
dered.

Ethiopia.

309
The death of Solomon fit
allise.

After the death of Theophilus, the line of Solomon by the queen of Sheba was superseded a second time, and a stranger of the name of *Oufas* seated on the Abyssinian throne. The extreme severity of Theophilus in punishing the murderers of both *Yafous* and *Tecla Haimanout* gave occasion to this; for as both princes had been assassinated in consequence of conspiracies formed by the principal people of the nation, the number of conspirators was so great, that the parties concerned had interest sufficient to influence the election of the new monarch even in this most capital respect, of his not being a descendant of Solomon. Excepting this single defect, he was in every respect worthy of the kingdom, and was already the highest subject in it. Scarce was he seated on the throne, however, when a dangerous conspiracy was formed against him by the very persons by whom he had been placed upon it. *Oufas* baffled their designs, by seizing the principal conspirators before they had time to bring their schemes to a bearing; and several people of the first rank were condemned to lose their noies, or to be put to death. After this the emperor undertook an expedition against the *Shangalia*, according to the barbarous custom of the Abyssinian monarchs, who hunt these poor people merely for the sake of making slaves; slaughtering the men without mercy as well as many of the women, and carrying off only the boys and girls into captivity. In this he met with perfect success; and was about to attempt the conquest of the whole country, when he was called back by the news that his prime minister *Tafa Chrislos* was dead. While the emperor remained in his capital at *Gondar*, he was taken suddenly ill; which he at first imputed to witchcraft, and therefore used some antidotes; among which the smoking of the palace with gun-powder was one. But this was done carelessly by the servants, that the whole building was consumed; an accident looked upon by the people in general as a very bad omen, especially as the king's complaint increased every day. At last the principal officers came to pay him a visit of condolence, as they pretended; but in reality to observe the nature of his distemper, and to consult whether or not it was likely to continue till they could fall upon means to deprive him of the government. *Oufas* understood their intentions, and therefore summoned all his strength to put on for a moment the appearance of health; so that the officers found him attending business as usual. Being thus disconcerted, it became necessary to make some apology for a visit so extraordinary and formal; for which they were at first somewhat at a loss: on recollection, however, they told him, that, hearing he had been sick, which they happily found was not the case, they had come to make a proposal concerning the succession; professing a desire that he would quiet the minds of his own family, and of the people in general, by appointing his son *Fasil* successor to the throne after his decease. *Oufas* gave them an equivocal answer; but the discourse concerning *Fasil* happening to be overheard by the soldiers, a violent mutiny ensued, and all the officers who had come to visit *Oufas* were killed. Part of the town was set on fire in the confusion; and at last a proclamation was made, that *David son of Yafous* was king of Abyssinia. The prince was then sent for from the mountain, and arriving at *Gondar* was crowned on the 30th of January 1714. The

310
The emperor falls sick.311
Oufas deposed, and David proclaimed emperor.

distemper of *Oufas* in the mean time continuing to increase, he died on the 10th of February the same year.

The new emperor was a rigid Alexandrian in principle; but *Oufas* had been so far favourable to the Catholics, as to entertain some of their priests, though in a private manner. As it was the custom, however, to call a convocation of the clergy on the accession of every new emperor, the monks and others insisted upon one being called on the present occasion; the more especially that a new abuna was come from Egypt, and the lenity shown to the Catholics by *Oufas* had excited the jealousy of the Abyssinian clergy in the highest degree. This assembly proved fatal to three Romish priests, whom *Oufas* had protected and supported for some time. They were brought before the king and Abyssinian clergy; who shortly asked them, whether they believed that the council of Chalcedon was to be accepted as a rule of faith, and that Pope *Leo* lawfully presided in it? To both these questions they answered in the affirmative: on which, without more trial, they were condemned to be stoned; and the sentence was instantly put in execution by the furious and ignorant multitude, only one person in the whole assembly exclaiming against it as unjust. The priests being thus gratified in one instance, insisted that *Abba Gregorius*, who had acted as an interpreter to the three just mentioned, should also be put to death; but this was prevented by *David*, who found, upon inquiry, that he had only done so in obedience to the express commands of *Oufas* his sovereign.

Here we must take notice, that though the faith of Abyssinia is always said to be the same with that of Alexandria, it is not for that reason to be imagined that the clergy are all of the same mind. On the contrary, many different parties exist among them, who hate one another no less than all of them do the church of Rome. The principal of these in the time we speak of were the monks of *Debra Libanos* and those of *St Eustathius*, to which last the emperor himself belonged. On the arrival of a new abuna, it is customary to interrogate him before the emperor and assembly of the clergy, which of the two opinions he adheres to. The emperor at present, not thinking his presence necessary, sent the betwixt with the principal persons of both parties to hear the profession of the new abuna, which was afterwards to be proclaimed to the people. The latter, probably not willing to contend with either party, gave an equivocal answer. But with this the king himself was dissatisfied; and therefore, without consulting the abuna farther, he caused it to be proclaimed, that the new abuna's profession was the same with that of the monks of *St Eustathius*. This was highly resented by the monks of *Debra Libanos*, who instantly ran to the abuna, and from him received a profession directly contrary to what had been proclaimed by the king's order. Not satisfied with this, they continued their tumult, disregarding the imminent danger they were in of falling under the king's displeasure. One of their number was so infuriated as to cry out, that he saw a cherub with a flaming sword guarding the door of the house where they were. Unluckily, however, they continued their assembly so long, and behaved in such a seditious manner, that the emperor sent against them a

Ethiopia.

312
Death of Oufas.
313
Reign of David.314
Three monks executed.315
Dissensions among the Abyssinian clergy.

Ethiopia

316
Great massacre of the clergy and odious.

317
The king poisoned.

318
Reign of Bacuffa.

319
Of Yafous II.

320
Applies himself to the arts of peace.

321
Is ridiculed by his subjects, and undertakes an expedition against Sennaar.

322
A division of his army cut off.

body of pagan Galla; who falling upon them sword in hand, killed upwards of 100 of the ringleaders, and then falling out into the street destroyed indiscriminately every one they met.

The massacre continued till the next day at noon, when a stop was put to it by the king's proclamation. The vast quantity of blood so wantonly shed, however, could not but occasion great discontent throughout the capital, and the bad effects of it soon appeared. The king was universally hated, and numberless conspiracies were talked of; but before any pretender to the crown appeared, David himself fell sick, the cause of which was found to be poison. The perpetrators of this crime being known, were instantly put to death; but nothing could save the life of the emperor, who died the 9th of March 1719 in great agony.

David was succeeded by his brother Bacuffa; who in the beginning of his reign proved very severe and cruel, cutting off almost all the nobility who could be supposed to have had any share in the conspiracies and seditions of former reigns: In the latter part of it he became much more mild, and was beloved by his subjects. He was succeeded in 1729 by his son Yafous II, who continued long under the regency of his mother; and as soon as he took the management of affairs upon himself, was disturbed with continual seditions and rebellions. In one of these the city of Gondar was made a field of battle, and was so frequently set on fire, as to be almost entirely reduced to ruins. Having at last succeeded in reducing all his enemies to obedience, he applied himself to the arts of peace, repairing and ornamenting his palaces, in which he employed some Greek artists. For this he renounced the diversion of hunting, and the barbarous expeditions against the Shangalla; but this way of life proved so disagreeable to his turbulent subjects, that a severe satire was published against him under the title of "The expeditions of Yafous the Little." Nettled at this reproach, he determined on an expedition against the kingdom of Sennaar, and having made the necessary preparations, invaded it with a formidable army, without the least pretence of provocation, or making any declaration of war. As he proceeded into the country of the enemy, he allowed his soldiers every where to exercise the greatest cruelties, to destroy every living creature with the sword, and every thing combustible with fire. Some of the Arabs joined him as he went along; many more fled from his presence; and a body of them tried to oppose him. These last were utterly defeated; and Yafous without delay prepared to march to Sennaar the capital of the kingdom. As he still went on, the king Baady being assisted by Hamis prince of a territory named *Dur Four*, surprised one division of his army so effectually, that they were all cut off to the number of 18,000. Yafous, however, still continued his destructive progress; though he gave over all thoughts of reducing the capital, or subduing the kingdom. He returned triumphant to Gondar, making a great show of the plunder he had acquired; though the dejected countenances of many of his army showed that they were by no means pleased with expeditions of this kind. The king himself was supposed to behold the distress of his subjects on this occasion with a malicious pleasure, on account of their impatience and turbulence in times

of peace, and their forcing him into a war when he had no inclination for it. In a short time, however, the people were perfectly comforted for the loss of their brethren. In the late unfortunate action they had lost all those holy utensils, which it is usual in Abyssinia to carry into the field of battle in order to ensure victory. Among these was a true picture of the crown of thorns which was put upon our Saviour's head; some pieces of the cross upon which he suffered; a crucifix which had spoken on many occasions; with many other sacred relics of equal value. Soon after the battle all these were redeemed by the priests at an extravagant rate; no less than 8000 ounces of gold having been given for the speaking crucifix; and for the rest, we are to suppose a proportional price had been paid. On the arrival of this trumpety at Gondar, the greatest rejoicings were made, and Yafous was astonished at the people having so soon forgot the loss of their countrymen and relations.

Soon after these transactions the abuna died; but though it was customary for the Abyssinian monarchs to advance the money necessary to bring a new one from Alexandria, Yafous found himself obliged to lay a tax upon the churches for defraying it at this time, having spent all his ready money in repairing and ornamenting his palaces. Three priests, consigned to the care of as many Mahometan factors, were sent to Egypt for the new patriarch; but they were detained for some time by the naybe or prince of Mafuah, who extorted from them one half of the money given by the emperor for bringing the abuna from Cairo. Yafous no sooner heard that they were detained at Mafuah, than he sent orders to Sulah Michael governor of Tigre to refuse provisions to the inhabitants of Mafuah, which would soon reduce the naybe to obedience: but as Michael intended soon to quarrel with the king himself, he was not in any haste to obey the orders he received. The travellers were therefore detained so long, that on their arrival at Jidda, they found they had lost the monsoon; and, what was worse, the scherif of Mecca would not allow them to pass without a fresh extortion. Their money was now exhausted; but the rapacious scherif put one of their number in prison, where he continued for a twelvemonth till the money arrived: and from this time these extortions were changed into a stated tribute; 75 ounces of gold (about L. 186 sterling) being granted for leave of passage to Cairo for the abuna; 90 ounces to the scherif, and as many to the naybe, for allowing the abuna to pass from Cairo; an agreement which subsists to this day. Several other insults of this kind being received from the naybe, Yafous at last discovered that there was a strict alliance betwixt him, the governor of Tigre, and the Baharnagash; any one of whom, had he thought proper, could have crushed this pitiful prince with the smallest effort. On this the emperor determined to march against him in person; but was prevented by a rebellion which had been purposely excited in the country of Azab and that of the Dobas. The rebels were easily overthrown; but thus the expedition against the Naybe was delayed for a year; during which but interval the emperor sent for Michael to Gondar. This vented order was positively refused, and a war ensued. Michael, unable to contend with the emperor in the open field, took to a high mountain, the usual refuge of governor of

Ethiopia

332
Religious utensils reckoned at an extravagant rate.

334
The messengers sent for the new Abuna insulted and robbed.

325
A stated tribute for the passage of the Abuna.

326
The emperor determined to march against him in person; but was prevented by a rebellion which had been purposely excited in the country of Azab and that of the Dobas. The rebels were easily overthrown; but thus the expedition against the Naybe was delayed for a year; during which but interval the emperor sent for Michael to Gondar. This vented order was positively refused, and a war ensued. Michael, unable to contend with the emperor in the open field, took to a high mountain, the usual refuge of governor of

327
War with Michael field, took to a high mountain, the usual refuge of governor of Abyssinian Tigre.

Ethiopia. Abyssinian rebels. Here also his bad fortune pursued him; all his posts were taken by storm excepting one, which, it was evident, would likewise have been carried, though not without a very great expence of men. Here Michael requested a capitulation; and to ensure favourable terms, he desired to put into the hands of Yafous a great quantity of treasure, which would otherwise be dissipated among the common soldiers. This being done, Michael defended with a stone upon his head, as confessing himself guilty of a capital crime, with a design to make submission to the emperor. This was prevented for one day by a violent storm of wind and rain; from which moment the Abyssinians believe he began to converse with the devil: but Mr Bruce informs us, that he has often heard him say it was Michael the archangel who was his correspondent.

329 Yafous was firmly determined to put this rebel to death, notwithstanding the quantity of gold he had received; nevertheless a promise was extorted from him that he would grant him his life. As soon as Michael came into his presence, the emperor was filled with indignation, retracted his promise, and ordered him to be carried out and put to death before his tent-door. The execution of the sentence, however, was prevented by the intercession of all the officers of any consideration in the court or army. Such universal sollicitation could not be withstood: Michael was pardoned; but with these remarkable words, that the emperor washed his hands of all the innocent blood which Michael should shed before he brought about the destruction of his country, which he knew he had been long meditating.

330 Michael continued for some time in prison; but was afterwards set at liberty, and even restored to his government of Tigré. No sooner was he reinstated in this dignity, than collecting an army, he attacked Kafati Waddo governor of Amhara, defeated him in two battles, and forced him to take refuge among the Galla, whom he soon after bribed to murder him. In other respects he behaved as a most dutiful subject, gave the king the best intelligence, and supplied him with soldiers better accoutred than he had ever before beheld. He was also more humble than before his misfortune; nor did an increase of his favour and influence make him deviate from the line he had prescribed. Having begun to gain friends by bribery, he continued to add one bribe to another to secure the old, and to gain new ones by the same means, pretending all the while to no kind of dignity or honour, not even to such as was justly due to his own rank. Thus he became such a favourite with the emperor, that he bestowed upon him the governments of Enderta and Sire, in addition to that of Tigré; so that he was now master of almost one half of Abyssinia. During the reign of Yafous, however, he attempted nothing. The foundations of the disturbances

331 Cause of the great civil war in Abyssinia. which succeeded were laid by the queen-mother, towards the end of the reign of Yafous. This emperor had been married when very young to a lady of Amhara, by whom he had two sons named Adigo and Aylo; but as his wife pretended to interfere in matters of state, he was persuaded by his mother to banish both her and her children to Wechne. After this his mother chose a wife for him from among the Galla; a people

of all others the most obnoxious to the Abyssinians, both on account of the horrid barbarity of their manners, and the continual wars which from time immemorial had taken place between the two nations. The new queen was the daughter of one Amiro, a prince who had once hospitably entertained Baoula before he became emperor; and his people were esteemed the least barbarous of the whole. A prejudice against her, however, against her offspring, and the emperor himself, never to be effaced, now took place among the Abyssinians; but this did not show itself during the reign of Yafous. The emperor died on the 21st of June 1753, being the 24th year of his reign, not without suspicion of being poisoned by his mother's relations, who were now attempting to engross the whole power of the empire into their hands.

On the death of Yafous, his son Ioas by the Galla princess just mentioned succeeded to the throne without any opposition. The discontent which had taken place in the former reign about the power assumed by the relations of the old queen, now began to show itself more openly; and it was complained that a relationship to her was the only way to preferment, by which means the old families, whose merit had often saved the state, were totally excluded from every share of favour. On the accession of the young king, a party of Galla horse, said to be about 1200 in number, were sent as the portion of his mother; and these were quickly followed by a number of private persons from motives of curiosity, or hopes of preferment, who were embodied to the number of 600 into a troop of infantry, the command of which was given to Woolleka. The great favour in which these people were at court soon induced many others to make their appearance. Two of the king's uncles were sent for by his express desire; and they brought along with them a troop of 1000 horse. By the time they arrived the queen was dead; but her two brothers, named *Brulha* and *Lubo*, finding that the king could not put an entire confidence in them, determined to make a party at court. This was easily effected; every thing was governed by Gallas; even the king himself affected to speak their language; while the Abyssinians were to the last degree mortified at seeing their inveterate enemies thus establishing a dominion over them in the heart of their own country. At last the king thought proper to appoint his uncle *Lubo* to the government of Amhara; but this produced such excessive discontent, that he was fain to retract his nomination, lest a civil war should have ensued. While the empire was thus divided into two parties, Sulul Michael came to Gondar in a very splendid manner, on an application from the exiled prince of Sennaar to be restored to his kingdom. When conducted into the presence of the emperor, he prostrated himself before him, owned himself his vassal, and was put in possession of the government of Ras-el-Feel upon the frontiers, with a large revenue, where he was advised to stay till the disputes which subsisted at that time should subside. This salutary advice, however, he had not prudence to comply with; but suffering himself to be decoyed from his asylum into Atbara, was taken prisoner and murdered.

334 The Galla introduced into Abyssinia. 335 Two of the king's uncles arrive, and engross all the power. 336 Sulul Michael arrives at court.

337 King of Sennaar murdered. In the mean time, the Abyssinian prime minister, Welled de l'Oul, died. He had hitherto moderated

Ethiopia.

338
State of the
different
parties.

the fury of the opposite parties by his wife and prudent conduct; but no sooner was he taken out of the way, than a most dreadful scene of confusion and civil war took place, which raged with the utmost violence while Mr Bruce was in Abyssinia, and seemed not likely to come to any termination when he left it. The whole empire was divided into two great factions: at the head of the one was the old queen-mother of Yafous; and at the head of the other, Isas himself the emperor, with his Galla relations. Matters were first brought to a crisis by the imprudence of the emperor himself in bestowing the government of Begemder upon Brulhe one of his Galla uncles. The government of this province had been lately resigned into the hands of the queen by an old officer named Ayo; and it was supposed that his son named *Mariam Barea*, universally allowed to be one of the most accomplished noblemen of the kingdom, was to succeed him in this government. This opinion was farther confirmed by the marriage of *Mariam* herself with *Ozoro Eilher*, a daughter of the old queen by her second husband. Unfortunately a quarrel had happened between *Kalmati Ayo*, the old governor of Begemder, and *Suhul Michael*, a little before the resignation of the former, and continued undecided till *Mariam* took the office upon him. The occasion was quite trifling; nevertheless, as *Mariam* had refused to submit to the decision of the judges, whom he stigmatized as partial and unjust, insisting that the king should either decide the affair in person, or that it should be referred to the decision of the sword, he thus fell under the imputation of being a disobedient and rebellious subject. In consequence of this, Isas looked upon him ever afterwards with an evil eye; and now deprived him, by proclamation, of the government of Begemder, giving it to his own Galla uncle *Brulhe*, of whom we have already made so much mention. This unexpected promotion threw the whole empire into a ferment. As Begemder was a frontier province bordering on the country of the Galla, there was not the least doubt, that, immediately on the accession of *Brulhe* to his new office, it would be over-run by that race of barbarians, remarkable for their savage manners almost beyond all the other nations in Africa. This was the more dangerous as there was not above a day's journey between the frontiers of Begemder and Gondar, the capital of the whole empire. *Mariam Barea* herself, who had a high sense of honour, was particularly hurt at the manner in which he was deprived of his dignity, and condemned with his family to be subject to a race of Pagans, whom he had often defeated in battle, and obliged to acknowledge him as their superior. All remonstrance, however, was vain. *Brulhe*, under the sanction of the imperial command, advanced with an army to take possession of his new dignity: but so exceedingly averse were the Abyssinians to follow him in this expedition, that the army disbanded itself several times after it had been collected; and it took up almost a year before he could proceed from the place where his camp was, at the lake Tzana or Dembea, to the frontiers of Begemder, though scarce half a day's journey distant. *Mariam Barea* beheld his operations with great contempt, employing his time in the dispatch of ordinary business, and endeavouring to reconcile himself to the king, but without success. As his last effort, he sent a remonstrance to

339
Brulhe made go-
vernor of
Begemder.340
An univer-
sal ferment
ensues.341
Is opposed
by *Mariam*
Barea.

the emperor; in which, after many protestations of duty and obedience, he reminded him, that, at his investiture into the office of governor of Begemder, he had sworn not to allow any of the Galla to enter his province: that, should he deviate from the observance of this oath, the safety of the princes in Wackne would be endangered; they would constantly be liable to the invasions of the Pagans, and probably be extirpated, as had already happened at two different times: and he begged of the emperor, if he was determined to deprive him of his government, to bestow it rather upon some Abyssinian nobleman; in which case he promised to retire, and live in private with his old father. He had, however, formed a resolution, which he thought it his duty to submit to the emperor, that if his majesty should think proper to come, at the head of a Galla army, to invade his province, he would retire to the farthest extremity of it, till he was stopped by the country of the Galla themselves; and, so far from molesting the royal army, he might be assured, that though his own men might be stationed, every kind of provision should be left for his majesty. But if an army of Galla, commanded by one of that nation, should enter the province, he would fight them at the well of Fernay, on the frontiers, before one of them should drink there, or advance the length of a pike into the province.

This remonstrance had no effect upon the emperor. He returned a scoffing answer, announcing the speedy arrival of *Brulhe*, whom he thought sure of victory: but, at the same time, to show that he did not put his confidence entirely in his prowess, he created *Suhul Michael* governor of *Samen*, which lay next to *Tigré* in the way to *Samen*, so that no obstruction might lie in the way of that officer's march to Gondar, in case there should be any occasion for him. *Mariam*, provoked at the manner in which he was undervalued in the king's message, gave an ironical reply, in which he alluded to the name of *Brulhe*, in the Abyssinian language signifying a kind of bottle; this he told him would be broken on the rocks of Begemder, if sent into that country.

On receiving this last message from *Mariam*, the king instantly ordered the army to be put in motion; but the Abyssinians had unanimously determined not to act offensively against their countrymen. *Brulhe* therefore was left to decide the affair with his Galla. *Mariam* kept exactly to his word in the declaration he had made to the king, not stirring out of his province, nor allowing the least attempt to be made to harass his enemy, till they were drawn up at the well above mentioned, where he met them with his army. The Galla, unsupported by the Abyssinian troops, were utterly unable to bear the shock of *Mariam's* army, and therefore soon betook themselves to flight; but a part of them, who were surrounded by the cavalry, fought valiantly till they were all cut to pieces. *Mariam* had given the most express orders to take *Brulhe* alive; or, if that could not be done, to allow him to make his escape. One of his servants, however, observing him in the field, pushed up through the enemy to the place where he was, and running him twice through with a lance, left him dead on the spot.

Mariam Barea was no sooner informed of the death of his rival, than he cried out in great emotion, that

Ethiopia.

342
Farther
promotion
of *Michael*.343
Brulhe de-
feated and
killed.

Ethiopia. Suhul Michael, with the whole army from Tigré, would attack him before autumn. In this he was not deceived. Ioas instantly dispatched an express for Michael, ordering his attendance, and investing him with the dignity of Ras, by which he became possessed of unlimited power both civil and military. Michael himself had for a long time seen that matters would come to this crisis at last, and had provided for it accordingly. He now set out with an army of 26,000 men, all of them the best soldiers in the empire, and 10,000 of them armed with muskets. As he passed along, his troops desolated the country wherever they came, but he encumbered his army by nothing useless; allowing his men to carry along with them neither women, tents, beasts of burden, nor even provisions. The subsistence of his troops was abundantly provided for by the miserable inhabitants of the provinces thro' which he passed; and, not satisfied with this, he insisted on a contribution in money from all the districts within a day's march of those places where he was; the least delay was followed by the slaughter of the inhabitants and destruction of their houses. Towns, villages, and buildings of every kind, were set on fire as he passed along; the people fled from all quarters to the capital for refuge, as from the face of the most inveterate enemy; and Ioas himself was now sensible of his having been in the wrong to invest him with such unlimited power. On his arrival at the capital, Michael took possession of all the avenues, as if he meant to besiege it; so that an universal consternation ensued. Instead of offering any hostility, however, he waited with the utmost respect on the emperor, proceeding immediately from the royal presence to his own house, where he sat in judgment, as the nature of his office required him to do. No sooner had he taken upon him this new office, however, than he executed justice in such a rigorous and impartial manner as made the boldest offenders tremble. Some parties of his own soldiers, presuming upon the licence that had hitherto been granted them, entered Gondar and began to plunder as they had done in other places; but, on the very first complaint, their commander caused 12 of them to be apprehended and hanged. Their execution was followed by 50 others in different quarters of the city; after which he gave the charge of the capital to three officers who were to preside over three quarters, himself taking care of the fourth. Two civil judges were appointed to assist each officer in a district, two were left in the king's house, and four of them held a court of judicature in his own. Thus the inhabitants, finding, that instead of bloodshed and massacre, they were to expect nothing but strict equity and moderation, became reconciled to Michael the day after his arrival, and lamented only that he had not come sooner to relieve them from the anarchy and confusion in which they had been held so long. To so great a degree of perfection indeed did he bring his legislation, that a very short time after he entered the city, a loaf of bread, a bottle of water, and an ounce of gold, were exposed in the market-place on the head of a drum night and day for some time, without any one offering to take them away. This was the more remarkable as there was then a scarcity of provisions, and Michael himself would allow but a very scanty supply of water to be carried into the city;

thereby giving the inhabitants to understand, that if he should set fire to it as he had done to other places, it would not be in their power to quench the flames.

The capital being thus secured in perfect obedience, Michael next prepared to set out on his expedition against Mariam Barca. Sensible, however, that the destruction of this worthy nobleman would be attended with a great degree of odium, he was resolved that none of it, or at least as little as possible, should fall upon himself. For this purpose, he insisted that the emperor should march in person from Gondar, and carry all his soldiers along with him. Thus he had an opportunity of throwing the whole blame upon Ioas, and representing himself as no more than a passive instrument in the affair. He also took every occasion of praising his antagonist for his virtues, and censuring the emperor for attempting to cut off such an excellent officer.

In the mean time Mariam Barca keeping exactly to the terms of the last remonstrance he had sent to Ioas, retired before him to the extremity of the province. Ioas and Michael advanced furiously, burning and destroying every thing as they went along. An engagement at last took place at a place called *Nefas Mufa*, on the extreme borders of Begemder, when Mariam could not retreat without going out of the province. As the royal army was more than twice the number of the other, and commanded by an officer of superior skill, victory was not long of being decided in its favour. Mariam, with 12 of his officers, took refuge in the country of the Galla; but were immediately delivered up by that faithless people. He was put to death by Lubo the brother of Brulhe, who is said with his own hands to have cut his throat as a sheela, and is commonly killed in this country, and afterwards to have disfigured the body in a shocking manner. The head was cut off, and carried to Michael's tent, who would not allow it to be uncovered in his presence. It was afterwards sent to the family of Brulhe in the country of the Galla, to show them what attention had been given to revenge his death; and this displeased the Abyssinians even more than any thing that had yet happened since the beginning of the contest. The 12 officers, who were taken along with him, sought protection in the tent of Ras Michael, to which they were suffered to escape by Woolseka their keeper. Lubo, however, intended likewise to have sacrificed them as he had done Mariam, and therefore sent Woolseka to demand them: but no sooner had he unfolded his errand, than Michael in a rage, called to his attendants to cut him in pieces before the tent-door; which would certainly have been done, had he not fled with the utmost precipitation.

The scandalous agency which the Galla always manifested over the king, had greatly displeased Michael; who expressed himself so freely on the subject, that a coolness took place between them. Another officer named *Waragna Fagil*, a Galla by birth, had insinuated himself into the king's favour, and greatly distinguished himself at the battle of Nefas Mufa. It was no wonder, therefore, that he soon became a rival to Michael; and this rivalry was greatly augmented by the following circumstance. Near the field of battle at Nefas Mufa was a

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Michael
marries the
princess O-
zoro Etlher.

house of Mariam Barca, where Ozoro Etlher his widow now was. Being surrounded by pleasant and verdant meadows, Fasil encamped there for the sake of his cavalry. No other design was at that time apparent; however, his presence greatly alarmed the princess. She had along with her at that time a nobleman named *Aylo Aylo*, who had been at the battle of Semmar; but had there been terrified to such a degree, that he refused to renounce the world ever after and turn monk. In this character he was now with Ozoro Etlher; and though he refused to be concerned in any military affairs, he was still consulted by both parties as a kind of oracle. In the present emergency, therefore, he told the princess that there was only one way by which she could secure herself from the cruelty of the Galla, and becoming a prey to one or other of the murderers of her husband; and that was by immediately espousing Ras Michael. Ozoro was perfectly sensible of the propriety of the advice, and therefore set out next morning in company with Aylo to Michael's tent. Here she threw herself at his feet on the ground; and refusing to rise, Aylo explained her errand, informing the Ras that she intended to follow herself upon him in marriage, as being the only person not guilty of her former husband's death capable of affording her protection in her present situation. Michael saw clearly the advantages attending such a match; and therefore having caused the army to be drawn up in order of battle, as if for a review, he sent for a priest, and was married to the princess in the sight of all his men. The ceremony was followed by the loud acclamations of the whole army; and Ioas was soon informed of the reason. He expressed his displeasure at the match, however, in such unequivocal terms, that a mutual hatred commenced from that moment. This was soon made public by a very trifling accident. One day while the army was marching, Michael being much incommoded by the sun which affected his eyes, threw a white handkerchief over his head to keep off the heat. This was instantly told the king, who took it as an affront offered to himself; for in Abyssinia it is unlawful to cover the head on any occasion whatever in presence of the emperor, or even within sight of the palace where he lodges. Ioas was no sooner informed of the supposed affront, than he sent to the Ras to know upon what account he presumed to cover his head in his presence; but though the covering was instantly taken off, it was thought that no atonement could ever be made for such a grievous offence. Soon after this a quarrel happening between Fasil and a person named *Gybo*, likewise a man of great consequence, complaint was made to the Ras, who, as civil judge, summoned both parties before him. Fasil absolutely refused to obey any such jurisdiction; and the affair being laid before the other judges, it was given in favour of Michael, and Fasil declared to be in rebellion. This was followed by a proclamation depriving him of his government of Damot, and every other public office he held. Fasil, however, had no mind to submit to this disgrace; and therefore, after holding a long conference with the king, departed with his army, encamping on the high road betwixt Damot and Gondar, where he intercepted the provisions coming from the southward to the capital. This was followed by an attempt to assassinate the Ras. A shot was fired from one of the windows of the palace into

the house where he sat in judgment; the distance being so small, that he could easily be seen from the palace while thus employed. The ball, however, missed Michael, but killed a dwarf who was standing before him fanning the flies from his face. As it was evident that this shot must have been fired with the knowledge of the king, it was rightly judged to be the commencement of hostilities. Ioas instantly removed to a distance, but sent *Woofheka* with orders to the Ras to return to Tigre without seeing his face; declaring, at the same time, his own uncle *Lubo* governor of Begemder and Amhara. Michael could scarcely be prevailed upon to see *Woofheka*, and told him that he should certainly be put to death the next time he appeared in his presence. Next day Ioas sent a message to the Ras by four judges, commanding him to return to Tigre without the least delay, under pain of his highest displeasure. Michael returned a formal answer, concluding, that he expected the king himself to be ready to march against Fasil to-morrow. To this an absolute refusal was given; on which Michael issued a proclamation, commanding all the Galla to leave the capital next day under pain of death; in case of disobedience they were declared outlaws, and liable to be killed by the first that met them if they were found 24 hours after the proclamation in the capital, or to the same penalty if they were found in the kingdom after ten days. An engagement took place a short time after, in which Fasil was totally defeated, and obliged to retire into Damot. In this engagement some of the king's black horse were taken. These are all slaves, and subject to no other commands but those of his majesty himself. The appearance of them therefore showed that they must have been sent by the king to fight against the Ras. All of them were therefore brought before the latter, and interrogated by whose orders they had come to the battle. Two refused to give any answer, and had their throats cut in presence of their companions. A third plainly told him that they had been sent by the king; who had likewise ordered an Armenian to fire out of the palace window at Ras Michael. On this the prisoners were dismissed; but assassins instantly dispatched to put an end to the king's life; which they accomplished, and buried him in a church dedicated to St Raphael.

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Fasil defeated
by Michael.

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Ioas assassinated.

On the death of Ioas, Michael, now absolute master of Abyssinia, set up for emperor *Hannes*, brother to the late king *Baousia*, an old man who had resided almost all his lifetime on the mountain of Wecline, being entirely unacquainted with the affairs of the world was on this account probably supposed by Michael to be the more proper for his purposes. *Hannes* had been maimed by the loss of his hand, on purpose to incapacitate him for the throne; but this objection was laughed at by the Ras. He found him, however, possessed of a quality much more inimical to his own purposes; and that was, an absolute aversion at meddling with the affairs of government: so that he could not by any means be induced to take the field against Fasil. Michael therefore was obliged to set out by himself; but thinking it improper to leave a king of any kind behind him in the capital, he had the old man poisoned before his departure; putting his son *Tecla Haïmannout* in his place.

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Hannes set
up by Michael,
and soon after
poisoned.

The young emperor, according to Mr Bruce's account,

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Final quar-
rel betwixt
Michael
and Fasil.

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A shot fired
at Michael
from the
palace win-
dow.

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Te. Hail-
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count, was of a fair complexion, less tawny than a Neap. Itan or Portuguese, owing to his having been born in the mountain. He was endowed with many princely accomplishments; and so much attached to Michael Ras, that he called him *Fatler* from the time of his accession, waiting upon him when indispensed with the affection of a son. There being now no objection therefore, Michael marched against Fasil with out delay, and entirely defeated him on the 3d of December 1769. On this occasion Woofleka was taken prisoner, and afterwards flung alive, notwithstanding the intercession of some of Michael's officers for him; his skin being afterwards formed into a bottle. This piece of cruelty was attributed to Ozoro Eilher; whom Mr Bruce represents as the most humane and merciful of women; though he is obliged to allow, that on the present occasion, as well as on every other which regarded her former husband, she entirely forgot her character. The night on which this miserable victim was destroyed, he appeared in the king's tent dressed like a bride; and in a little time returned in triumph to G-andar.

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Mr Bruce's
arrival and
adventures
in Abyssinia.

Soon after these transactions, Mr Bruce entered Abyssinia. He arrived at Masuah when there was only a report of Hannes's being ill, and Mr Bruce was supposed to be his physician, though in truth that emperor was already dead. Here he was ill-treated by the naybe, with a design to extort money, and afterwards probably to put him to death, as was his custom with other strangers. He escaped the danger, however, by the protection of Achmet, nephew and heir apparent to the naybe; and by his own prudent and resolute behaviour, threatening his adversaries with the arrival of a British man of war in case of any injury; showing the Grand Signior's protection; making use of the name of Ras Michael, now so formidable, and to whom he had obtained a recommendation, &c. After many vexations and delays, he was at last allowed to depart; and a guide, by name *Saloomé*, was sent along with him. This man was brother-in-law to the naybe, and a professed Christian; but a traitor in his heart, and who wished to do every thing in his power to hurt our traveller. He was furnished with another guide, however, by his friend Achmet, to inform him where to pitch his tent, and other necessary particulars.

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Sets out
from Ar-
keeko.

On the 15th of November 1769 Mr Bruce left Arkeeko on the eastern coast of Africa, and proceeded southward for Gondar the capital of Abyssinia. After an hour's journey, he pitched his tent near a pit full of rain-water, where he remained all day; and in the evening a messenger arrived from the naybe, who took away the guide *Saloomé*. Next day the latter returned in company with Achmet the naybe's nephew, already mentioned. The latter caused him deposit in his hands *Saloomé's* full hire, as though he had gone the whole length he had promised. Four of the men were commanded to go back to Arkeeko, and others put in their place: after which Achmet told Mr Bruce, that he was not to take the road through Dobarwa, though near, because it belonged to the naybe; but that *Saloomé* knew another by a place called *Dixan*, which belnged to himself, and where he could ensure him of a good reception. In this journey he told him, that he would be obliged to cross the mountain of Taranta, the highest in Abyssinia;

but the fatigue of this would be more than recompensed by the assurance of safety and the curiosity of the place. Taking leave of Achmet in a very friendly manner, therefore, Mr Bruce with his company finally set out on their journey the evening of the 16th. For the short space they had travelled, the ground was covered with grass broader in the leaf than ours; but in a little time the soil became hard, dry, gravelly, and full of acacia or Egyptian thorn. Next day (17th) they changed their course from south to west; and soon arrived at a range of mountains standing close to one another, that there was no passage between them excepting what was worn by torrents of water; the bed of one of which consequently now became their road. In the evening they pitched their tent at some distance from this torrent, which had scarcely any water in it when they left it; but all the afternoon there had been an appearance of rain, with much thunder and lightning, at a distance. On a sudden they heard a noise among the mountains louder than thunder; and instantly saw the torrent, swelled immensely by the distant rains, now running like a rapid river, and the foremost part of it advancing in its bed in a body of water about the height of a man. Having run for some time in this violent manner, the current, no longer supplied by the rains, began to diminish, and by the next morning was quite gone. Among these mountains the nights are cold even in summer.

On the 18th the journey was resumed in the bed of the torrent, which now scarcely had any water; though the stones were rendered very slippery by the quantity of rain which had fallen. Leaving this disagreeable road, they came to a fine rivulet; which being the first clear water they had seen from the time Mr Bruce left Syria, was exceedingly agreeable. They proceeded along the banks of this river for some time; and soon after leaving it, they came to another of the same kind: but next day were obliged to resume their course in the bed of a torrent. The mountains in this part of the world are excessively rugged and full of precipices, entirely destitute of soil, and covered with loose stones of a black colour. On the side of the torrent in which they marched, however, there grew very large fycamore trees, some of them little less than 7½ feet in diameter. Their branches afforded shelter to an infinite number of birds; many of them without song; but others having notes very different from the European kinds, and peculiar to the continent of Africa. Most of those which had very beautiful colours were of the jay or magpie kind. The trees were loaded with figs; but they came to nothing, by reason of the ignorance of the savages, who know not the process of caprification. The streams of water themselves, which at this season were found so delightful, run only after October: they appear on the east side of the mountains when the summer rains in Abyssinia are ceasing; at other times, no water is to be met with, excepting what is contained in stagnant pools.

On the 20th of November they began to ascend the high mountain of Taranta. Their road was now excessively rugged and uneven, intersected with monstrous gullies and holes made by the torrents, as well as by huge fragments of rocks tumbled down by the torrents. It was with the utmost difficulty that they could

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Account of
the country
through
which he
passed.364
Sudden
swell of a
torrent.365
Notes of
the African
birds dif-
ferent from
those of
Europe.366
Account of
the moun-
tain Taranta.

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could carry the astronomical instruments up this hill; in which work Mr Bruce himself, and one of his attendants named *Tafine*, a Moor, bore a principal share. The only misfortune they met with was, that their asses being unloaded, and committed to the care of a single person, refused to ascend this barren mountain; and in spite of all that their driver could do, set off at a brisk trot for the fertile plains below. Luckily, however, they were afterwards recovered by four Moors sent after them, and the journey resumed without any material interruption. The beasts were now become much more tractable, having been seen and pursued by the hyenas with which that mountain abounds.

Taranta is so destitute of earth, that there was no possibility of pitching a tent upon it; so that our travellers were obliged to take up their lodging in one of the caves with which it abounds. The under part of the mountain produces in great plenty the tree called *Kolquall*, which was here observed in greater perfection than in any other place throughout the whole journey. The middle part produced olives which carried no fruit; and the upper part was covered with the oxycedras or Virginia cedar, called *arce* in the language of the country. On the top is a small village named *Halai*, inhabited by poor shepherds, who keep the flocks of the rich people of the town of Dixon below. They are of a dark complexion, inclining to yellow; their hair black, and curled artificially by means of a stick, and which our author supposes to be the same with the *crisping-pin* mentioned Isa. iii. 22. The men have a girdle of coarse cotton-cloth, swathed six times round their middle; and they carry along with them two lances, and a shield made of bulls hides. Besides these weapons, they have in their girdles a crooked knife with a blade about 16 inches in length, and three in breadth at the lower part. There is here great plenty of cattle of all kinds; the cows generally of a milk white, with dew-laps hanging down to their knees; their horns wide like those of the Lincolnshire cattle; and their hair like silk. The sheep are all black both here and throughout the province of Tigré; having hair upon them instead of wool, like the rest of the sheep within the tropics; but remarkable for its lustre and softness, without any bristly quality. On the top of the mountain is a plain, which, at the time our author was there, they had sown with wheat. The air seemed excessively cold, though the barometer was not below 50° in the evening. On the west side the cedars, which on other parts are very beautiful, degenerate into small shrubs and bushes.

The road down this mountain was for some time nothing inferior in ruggedness to what they had met with in ascending it; but as they approached Dixon, it became considerably better. This is the first town on the Abyssinian side of Taranta. It is seated on the top of an hill of a form exactly conical, surrounded by a deep valley like a ditch; and no access to it but by a path which winds round the hill. The inhabitants were formerly exterminated by Michael Ras; and the succeeding race, in Mr Bruce's time, were of a very indifferent character, being, as he says, composed of the worst people from the territories of the Baharnagash and the province of Tigré, on both of

which it borders. Here he was in danger from the treachery of Saloomé, who wished to have decoyed him into the power of some assassins. Finding that this could not be done, he surrounded Mr Bruce and his retinue with a body of armed men; but they were dispersed by the authority of Hagi Abdelcader, the friend of Achmet, who had received orders to provide for the safety of the travellers. The only trade carried on here is that of buying and selling slaves; who are stolen from Abyssinia, chiefly by the priests, and sent into Arabia and India.

The next stage was from Dixon to Adowa, capital of the province of Tigré. Leaving Dixon on the 25th of November, they pitched their tent the first night under a large spreading tree called *Daroo*, which Mr Bruce says was one of the finest he saw in Abyssinia, being about 7½ feet in diameter. They had been joined by some Moors driving 20 loaded asses and two bulls, which in that country are likewise used as beasts of burden. Here, our author says, he recovered a tranquillity of mind which he had not enjoyed since his arrival at Masuah; but they were now entirely without the dominions of the naybe, and entered into those of the emperor. Saloomé attended them for some way, and seemed disposed to proceed; but one of the company, who belonged to the Abyssinian monarchy, having made a mark in the ground with his knife, told him, that if he proceeded one step beyond that, he would bind him hand and foot, and leave him to be devoured by wild beasts.

Being now in a great measure delivered from their fears and embarrassments, the company proceeded on their journey with pleasure, through a much better country than they had hitherto passed. In some places it was covered with wild oats, wood, high bent-grass, &c. but, in not a few places, rocky and uneven. Great flocks of a bird as large as a turkey, called, in the Amharic language, *Erkoom*, were seen in some places. A large animal of the goat kind, called *Agazan*, was found dead and newly killed by a lion. It was about the size of a large ass, and afforded a plentiful repast. Numbers of kolquall trees were also seen; and the sides of the river Habesh were adorned with a beautiful tree of the same name with the stream. There were in this place also many flowers of various kinds, particularly jessamine. The mountains of Adowa, which they came in sight of on the 5th of December, are totally unlike any thing to be met with in Europe; their sides being all perpendicular rocks, like steeples or obelisks of many different forms.

Adowa, though the capital of an extensive province or kingdom, does not contain above 300 houses; but occupies nevertheless a large space, by reason of the inclosures of a tree called *Wansey*, which surrounds each of the houses. It stands on the declivity of a hill, situated on the west side of a small plain surrounded by mountains. It is watered by three rivulets which never become dry even in the greatest heats. A manufacture is carried on here of a kind of coarse cotton cloth, which passes for money throughout all Abyssinia. The houses are built of rough stone cemented with mud; lime being only used in the construction of those at Gondar, and even there it is very bad.

Our traveller was very hospitably entertained at Adowa

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Of the vil-
lage Halai,
and inhabi-
tants of the
mountain.

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Beautiful
cattle, &c.

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Town of
Dixon de-
scribed.

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Journey to
Adowa, the
capital of
Tigré.

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His trea-
cherous obli-
gation to re-
turn.

372
The coun-
try be-
comes more
fertile as he
passes a-
long.

373
Adowa de-
scribed.

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374
Vitr's the
ruins of
Axum.

dowa by one Janni, with whom he resided during his stay there. Leaving it on the 17th of December, he visited the ruins of Axum, once the capital of the empire. Here are 40 obelisks, but without any hieroglyphics. A large one still remains, but the two largest are fallen. There is also a curious obelisk, of which he gives a figure, with other antiquities which our limits will not allow us to enlarge upon. The town has at present about 600 houses, and carries on manufactures of the coarse cotton-cloth already mentioned. It is watered by a small stream which flows all the year, and is received into a fine basin 150 feet square, where it is collected for the use of the neighbouring gardens. Its latitude was found by Mr Bruce to be $14^{\circ} 6' 36''$ north.

On the 20th of January 1770, our traveller set out from Axum. The road was at first smooth and pleasant, but afterwards very difficult; being composed of stones raised one above another, the remains of a magnificent causeway, as he conjectures. As they passed farther on, however, the air was every where perfumed by a vast number of flowers of different kinds, particularly jessamine. One species of this, named *Agam*, was found in such plenty, that almost all the adjacent hills were covered by it; the whole country had the most beautiful appearance; the weather was exquisitely fine, and the temperature of the air agreeable. In this fine country, however, Mr Bruce had the first opportunity of beholding the horrible barbarity of the Abyssinians in cutting off pieces of flesh from the bodies of living animals, and devouring them raw; but notwithstanding this extreme cruelty, they have the utmost horror and religious aversion to pork of every kind; inasmuch that Mr Bruce durst not venture to taste the flesh of a wild boar, just after having assisted in the destruction of five or six.

During the remaining part of the journey from Adowa to Siré, the country continued equally beautiful, and the variety of flowers and trees greatly augmented; but as a report was propagated that Ras Michael had been defeated by Fasil, they now met with some insults. These, however, were but trifling; and on the 22d in the evening they arrived safely at Siré, situated in N. Lat. $14^{\circ} 4' 35''$.

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Siré de-
scribed.

This town is still larger than Axum: but the houses are built of no better materials than clay, and covered with thatch; the roofs being in the form of cones, which indeed is the shape of all those in Abyssinia. It stands on the brink of a very steep and narrow valley, through which the road is almost impassable. It is famous for a manufacture of cotton-cloth, which, as we have already observed, passes for money throughout the whole empire. At some times, however, beads, needles, antimony, and incense, will pass in the same way. The country in the neighbourhood is extremely fine; but the inhabitants subject, by reason of the low situation, to putrid fevers. On leaving it on the 24th, our travellers passed through a vast plain, where they could discern no hills as far as the eye could reach, excepting some few detached ones standing on the plain, covered with high grass, which the inhabitants were then burning. The country to the northward is flat and open. In the way to Gondar, however, lie that ridge of mountains called *Samen*; of which one named *Lamalm* is the most remarkable, and by some supposed to be the highest in Abyssinia. Betwixt Siré and these

mountains the river Tacazze runs, which, next to the Nile, is the largest in Abyssinia. Mr Bruce informs us that it carries near one third of the water which falls on the whole empire; and when passing it, he saw the marks of its stream, the preceding year, 18 feet perpendicular above the bottom; nor could it be ascertained whether this was the highest point to which it had reached. It has its source in the district of Angot, rising from three sources like the Nile, in a flat country, about 200 miles to the S. E. of Gondar. It is extremely pleasant; being shaded with fine lofty trees, the water extremely clear, and the banks adorned with the most fragrant flowers. At the ford where they crossed, this river was fully 200 yards broad, and about three feet deep; running very swiftly over a bottom of pebbles. At the very edge of the water the banks were covered with tamarisks, behind which grew tall and stately trees, that never lose their leaves. It abounds with fish, and is inhabited by crocodiles and hippopotami; the former of which frequently carry off people who attempt to cross the river upon blown up skins. The neighbouring woods are full of lions and hyænas. The Tacazze is marked by Mr Bruce in his map as a branch of the Allabaras, which falls into the Nile. The latitude of the ford was found to be $13^{\circ} 42' 45''$.

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Tacazze ri-
ver describ-
ed.

This river was passed on the 26th of January; after which our travellers entered into the country of *Samen*, the governor of which, *Ayto Tesfos*, had never acknowledged the authority of Ras Michael, nor any of the emperors set up by him since the death of *Ioa*s. The country therefore was hostile; but the uncertainty of the event of the war, and the well-known severity of Michael's disposition, preserved our traveller and his company from any insult, excepting a feeble and unsuccessful attempt to extort money. Here Mr Bruce observes that the people were more fastidious than any he had hitherto seen in Abyssinia. The path among the mountains was for the most part exceedingly dangerous, having a precipice of vast height close by it which way soever you turn. The mountains appeared of very extraordinary shapes; some being like cones; others high and pointed like columns, pyramids, or obelisks. In one place a village was observed in such a dangerous situation, that scarce the distance of a yard intervened between the houses and a dreadful precipice. Below it is a plain of about a mile square, covered with citron and lemon trees. A river named *Mai-Lumi* rises above this village, and falls into the wood, where it divides in two; one branch surrounding the north and the other the south part of the plains; then falling down a rock on each side, they unite; and having run about a quarter of a mile farther, the stream is precipitated in a cataract 150 feet high. The lions and hyænas were very numerous among these mountains, and devoured one of the best mules our travellers had. The hyænas were so bold, that they stalked about as familiarly as dogs, and were not intimidated by the discharge of fire-arms, the hyænas. Their voracity was such, that they eat the bodies of those of their own species which our travellers had killed in their own defence.

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Extrem-
e voracity of
the hyænas.

On the 7th of February they began to ascend *Lamalm* by a winding path scarcely two feet broad, on the brink of a dreadful precipice, and frequently intersected by the beds of torrents, which produced very irregular chasms in it. After an ascent of two hours, attended

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Lamalm on
mountain de-
scribed.

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attended with incredible toil, up this narrow path, they came to a small plain named *Kedus* or *St Michael*, from a church of that name situated there. This plain is situated at the foot of a steep cliff, terminating the western side of the mountain, which is as perpendicular as a wall, with a few trees on the top. Two streams of water fall down this cliff into a wood at the bottom; and as they continue all the year round, the plain is thus preserved in continual verdure. The air is extremely wholesome and pleasant. On ascending to the very top of the mountain, where they arrived on the 9th of February, our travellers were surprised to find, that though from below it had the appearance of being sharp-pointed, it was in reality a large plain, full of springs, which are the sources of most rivers in this part of Abyssinia. These springs boil out of the earth, sending forth such quantities of water as are sufficient to turn a mill. A perpetual verdure prevails; and it is entirely owing to indolence in the husbandman if he has not three harvests annually. The Lamlalmon stands on the north-west part of the mountains of Samen; but though higher than the mountains of Tigré, our author is of opinion that it is considerably inferior to those which are situated on the south-east. The plain on the top is altogether impregnable to an army, both by reason of its situation and the plenty of provisions it affords for the maintenance of its inhabitants; even the streams on the top are full of fish. Here the mercury in the barometer stood at 25 $\frac{1}{2}$ inches.

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Journey to
Gondar.

During the time our travellers remained at Lamlalmon, a servant of Ras Michael arrived to conduct them safely to the capital, bringing a certain account of the victory over Fasil; so that now the difficulties and dangers of their journey were over. The country appeared better cultivated as they approached the capital; and they saw several plantations of sugar-canes, which there grow from the seed. In some places, however, particularly in Woggora, great damage is done by swarms of ants, rats, and mice, which destroy the fruits of the earth. Mr Bruce had already experienced the mischief arising from a small species of ant, whose bite was not only more painful than the sting of a scorpion, but issued out of the ground in such numbers as to cut in pieces the carpets and every thing made of soft materials to which they could have access.

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Mischief
done by
ants.

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Arrival at
Gondar.

When Mr Bruce approached the capital, he was dressed like a Moor: on this dress he was advised to keep until he should receive some protection from government; his greatness, indeed his only danger arising from the priests, who were alarmed at hearing of the approach of a Frank to the capital. This was the more necessary, as the emperor and Michael Ras were both out of town. For this reason also he took up his residence in the Moorish town at Gondar; which is very large, containing not fewer than 3000 houses. The only inconvenience he underwent here was the not being allowed to eat any flesh: for we have already taken notice of a law made by one of the emperors, that none of his subjects should eat flesh but such as had been killed by Christians; and a deviation from this would have been accounted equal to a renunciation of Christianity itself. Here he remained till the 15th of February; when Ayto Aylo waited upon him, and addressed him in the character of physician, which he

N° 120.

had assumed. By this nobleman he was carried to the palace of Kofcam, and introduced to the old queen. His advice was required for one of the royal family who was ill of the small-pox; but a faint had already undertaken his cure. The event, however, proved unfortunate; the patient died, and the faint lost his reputation. Our limits will not allow us to give any particular account of the steps by which Mr Bruce arrived at the high degree of reputation which he enjoyed in Abyssinia. In general his success in the practice of medicine, his skill in horsemanship, and the use of firearms, which by his own account must be very extraordinary; his prudence in evading religious disputes; as well as his personal integrity and presence of mind, which never once failed him, even in the greatest emergencies; all conspired to render him agreeable to people of every denomination. By the king he was promoted to the government of Ras-el-Fel, was his constant attendant on all occasions, and was with him in several military expeditions; but never met with any opportunity of distinguishing his personal valour, though he had the command of a body of horse at one of the battles fought at a place named *Sertrusor*. Thus honoured and employed, he had an ample opportunity of exploring the sources and cataracts of the Nile, as well as the geography and natural products of the whole country; obtaining also leave at last to return home. We cannot, however, praise the benevolence of his spirit at his departure. It has already been observed, that he was in some danger from the priests on his first arrival, on account of their suspecting him to be a Jesuit; for that is the meaning which they affix to the word *Frank* or *European*. As he constantly attended the established worship of the country, however, and carefully avoided all disputes on the subject of religion, he became at last not only unsuspected, but very intimate with many of the principal ecclesiastics. From one of these, named *Tesfa Chri-flos*, he asked a benediction immediately before he departed; which piece of unexpected humility so affected the priest, that it brought tears in his eyes. The benediction was conveyed in the simple form, "God bless you." A troop of inferior priests who attended would needs bless him also; and probably were pleased at having it in their power to bestow a benediction publicly on a man of such consequence; but to the blessings of these poor monks Mr Bruce replied in *English*, "Lord send you all a halter, as he did Abba Salama!" This Abba Salama had been an ecclesiastic of great consequence; but of a very dissolute life, and at last hanged for his crimes. The monks imagined he had been recommending them to their patriarch Abba Salama, and with great devotion answered "Amen."

The history of the war after Mr Bruce's arrival is related at great length in his work. The king Tecla Haimanout still kept his ground, and was at last acknowledged by almost the whole empire, though success did not always attend his arms. An usurper, named *Sociniar*, was reduced and made a servant in the king's kitchen; but was afterwards hanged for theft. Ras Michael, notwithstanding all his skill in military affairs, was not able to get the better of Fasil; and his excessive cruelty, avarice, and ambition, disgusted every one. An attempt was even made to assassinate him; and his spiritual friend (Michael the archangel,

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Mr Bruce
introduced
to the
queen.

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Is prom-
ised and
held in
great esti-
mation.

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His depar-
ture from
the coun-
try.

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Even if
the war be
lost he left
the coun-
try.

Ethiopia.

archangel, according to his own report, or the devil, according to that of the Abyssinians) at last forsook him; so that he was carried off prisoner by a party of the rebels. After this misfortune he was much dejected, imputing it to the want of the spiritual assistance just mentioned, and which it seems had withdrawn itself some time before. His wife Ozoro Ester, whom Mr Bruce characterises as the handsomest woman he ever saw, was in great favour with the king at the time our traveller left Abyssinia. As the king himself was a handsome young man, there is no improbability in supposing with Mr Bruce, that "they were not inensible to each other's merits;" and as she was sometimes honoured with a *private audience*, where Michael himself "bore no part in the conversation," we shall conclude our history of this singular empire by a conjecture, that soon after Mr Bruce's departure, Michael either died by course of nature, he being then very old, or was cut off by his enemies; on which Tecla Haimanout, having fully settled the affairs of his empire, became possessed of the beautiful Ozoro Ester, and commenced his reign with great glory.

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Geography
of ancient
Ethiopia.

With regard to the geographical description of ancient Ethiopia, little can be said; as not even the boundaries of the empire itself, much less those of the particular districts which composed it, were known. The ancient writers, however, agreed that it was very mountainous: but they mention no mountains of any consequence excepting Garbata and Elephas, whose situation is not well ascertained, tho' it is generally supposed that they answer to the mountains of Tigré. The most noted cities were Axum, Napata, Premis or Premnis, Melis, Mondus, Abalis, Mofylon, Caloe, Opone, &c.

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Customs of
the inhabi-
tants.

The nations which inhabited ancient Ethiopia have already been enumerated; and it is not to be supposed that all, or indeed any two of them, would agree in many respects. The ancient historians, however, give the following information. They had many laws which were very different from those of other nations; especially their laws relating to the election of kings. The priests chose the most reputable men of their body, and drew a large circle around them, which they were not to pass. A priest entered the circle, running and jumping like an *Ægipan* or a satyr. He of those that were inclosed in the circle who first caught hold of the priest, was immediately declared king; and all the people paid him homage, as a person entrusted with the government of the nation by Divine Providence. The new-elected king immediately began to live in the manner which was prescribed to him by the laws. In all things he exactly followed the customs of the country; he paid a most rigid attention to the rules established from the origin of the nation, in dispensing rewards and punishments. The king could not order a subject to be put to death, though he had been capitally convicted in a court of justice; but he sent an officer to him, who showed him the signal of death. The criminal then shut himself up in his house, and was his own executioner. It was not permitted him to fly to a neighbouring country, and substitute banishment for death; a relaxation of the rigour of the law, with which criminals were indulged in Greece.

We have the following extraordinary information with regard to the death of many of their kings: The priests of Merœ, who had acquired great power there, when they thought proper, dispatched a courier to the

king to order him to die. The courier was commissioned to tell him, that it was the will of the gods, and that it would be the most heinous of crimes to oppose an order which came from *them*. Their first kings obeyed these groundless despoling sentences, though they were only constrained to such obedience by their own superstition. Ergameus, who reigned in the time of Ptolemy the second, and who was instructed in the philosophy of the Greeks, was the first who had the courage to shake off this iniquitous and sacerdotal yoke. He led an army against Merœ, where, in more ancient times, was the Ethiopian temple of gold; where he put all the priests to the sword, and instituted a new worship.

The friends of the king had imposed on themselves a very singular law, which was in force in the time of Diodorus Siculus. When their sovereign had lost the use of any part of his body, by makdy, or by any other accident, they inflicted the same infirmity on themselves; deeming it, for instance, shameful to walk straight after a lame king. They thought it absurd not to share with him corporal inconveniences; since we are bound by the ties of mere friendship to participate the misfortunes and prosperity of our friends. It was even customary among them to die with their kings, which they thought a glorious testimony of their constant loyalty. Hence the subjects of an Ethiopian king were very attentive to *his* and their common preservation; and therefore it was extremely difficult and dangerous to form a conspiracy against him.

The Ethiopians had very particular ceremonies in their funerals. According to Ctesias, after having salted the bodies, they put them into a hollow statue of gold which resembled the deceased; and that statue was placed in a niche on a pillar which they set up for that purpose. But it was only the remains of the richest Ethiopians that were thus honoured. The bodies of the next class were contained in silver statues; the poor were enshrined in statues of earthen ware.

Herodotus* informs us, that the nearest relations of the dead kept the body a year in their houses, and offered sacrifices and first-fruits during that time to their deceased friend; and at the end of the year, they fixed the niche in a place set apart for the purpose near their town.

The Ethiopians made use of bows and arrows, darts, lances, and several other weapons, in their wars, which they managed with great strength and dexterity. Circumcision was a rite observed amongst them, as well as among the Egyptians, from very early antiquity; though which of these nations first received it, cannot certainly be known. The Ethiopian soldiers tied their arrows round their heads, the feathered part of which touched their foreheads, temples, &c. and the other projected out like so many rays, which formed a kind of crown. These arrows were extremely short, pointed with sharp stones instead of iron, and dipped in the *virus* of serpents, or some other lethiferous poison, inasmuch that all the wounds given by them were attended with immediate death. The bows from which they shot these arrows were four cubits long; and required so much strength to manage them, that no other nation could make use of them. The Ethiopians retreated fighting, in the same manner as the Parthians; discharging volleys of arrows with such dexterity and address whilst they were retiring full-speed, that they terribly galled the enemy. Their lances or darts were

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Lib. iii.
c. 24.

Ethiopia. of an immense size, which may be deemed a farther proof of their vast bodily strength.

Thus far chiefly with regard to the Ethiopians who lived in the capital, and who inhabited the island of Merœ and that part of Ethiopia which was adjacent to Egypt.

There were many other Ethiopian nations, some of which cultivated the tracts on each side of the Nile, and the islands in the middle of it; others inhabited the provinces bordering on Arabia; and others lived more towards the centre of Africa. All these people, and among the rest those who were born on the banks of the river, had flat noses, black skins, and woolly hair. They had a very savage and ferocious appearance; they were more brutal in their customs than in their nature. They were of a dry adult temperament; their nails in length resembled claws: they were ignorant of the arts which polish the mind: their language was hardly articulate; their voices were shrill and piercing. As they did not endeavour to render life more commodious and agreeable, their manners and customs were very different from those of other nations. When they went to battle, some were armed with buckles of ox's hide, with little javelins in their hands; others carried crooked darts; others used the bow; and others fought with clubs. They took their wives with them to war, whom they obliged to enter upon military service at a certain age. The women wore rings of copper at their lips.

Some of these people went without clothing. Sometimes they threw about them what they happened to find, to shelter themselves from the burning rays of the sun. With regard to their food, some lived upon a certain fruit, which grew spontaneously in marshy places: some ate the tenderest shoots of trees, which were defended by the large branches from the heat of the sun; and others sowed Indian corn and lots. Some of them lived only on the roots of reeds. Many spent a great part of their time in shooting birds; and as they were excellent archers, their bow supplied them with plenty. But the greater part of this people were sustained by the flesh of their flocks.

The people who inhabited the country above Merœ made remarkable distinctions among their gods. Some, they said, were of an eternal and incorruptible nature, as the sun, the moon, and the universe; others having been born among men, had acquired divine honours by their virtue, and by the good which they had done to mankind. They worshipped Isis, Pan, and particularly Jupiter and Hercules, from whom they supposed they had received most benefits. But some Ethiopians believed that there were no gods; and when the sun rose, they fled into their marshes, execrating him as their cruellest enemy.

These Ethiopians differed likewise from other nations in the honours which they paid to their dead. Some threw their bodies into the river, thinking that the most honourable sepulchre. Others kept them in their houses in niches: thinking that their children would be stimulated to virtuous deeds by the sight of their ancestors; and that grown people, by the same objects, would retain their parents in their memory. Others put their dead bodies into coffins of earthen ware, and buried them near their temples. To swear with the hand laid upon a corpse, was their most sacred and inviolable oath.

The savage Ethiopians of some districts gave their crown to him who of all their nation was best made. Their reason for that preference was, that the two first gifts of heaven were monarchy and a fine person. In other territories, they conferred the sovereignty on the most vigilant shepherd; for he, they alleged, would be the most careful guardian of his subjects. Others chose the richest man for their king; for he, they thought, would have it most in his power to do good to his subjects. Others, again, chose the strongest; esteeming those most worthy of the first dignity who were able to defend them in battle.

The Jesuit missionaries were the first who gave any information to the Europeans concerning this country; and indeed, excepting them and the late accounts by Mr Bruce, we have no other source of information concerning it. The missionaries confirm what is said by the ancients, that Ethiopia is a very mountainous country. The provinces of Begender, Gojam, Wallicka, Shoa, &c. according to them, are only one continued chain of mountains. Many of them were said to be of such enormous height, that the Alps and Pyrenees are but mole-hills in comparison of them. Those called *Aorni* were said to be of this kind; but Mr Bruce informs us, that these accounts are greatly exaggerated. Amongst those mountains, and even frequently in the plains, there are many steep and craggy rocks to be met with of various and whimsical shapes; some of them so smooth, that men and oxen are craned up to the top by means of engines: but what is most surprising, the tops of these rocks are covered with woods and meadows, full of springs and streams of water; of the truth of which we have an attestation by Mr Bruce in his description of Lamalmon. The most remarkable of these, according to the authors we are now speaking of, is that called *Amba Geyhen*, mentioned in the course of this article as one of the mountains used for a prison to the princes of the blood. Its top is described as only half a league in breadth, tho' it is said that it would require near half a day to go round it. Kircher mentions also a rock which resembles a mirror at a distance; though this is probably not to be depended upon.

The climate of Ethiopia varies, as may naturally be supposed, according to the situation and elevation of the ground. On the coast of the Red Sea, as well as the open flat parts of the country in general, the heat is intense, inasmuch that at Suakem, an island in the Red Sea, Gregory the Abyssine relates that it was so great, as to excoriate any part of the body exposed to the solar rays, melt hard sealing-wax, and scar a garment like red hot iron. In several districts, however, the heat is milder than in Portugal, and in Samen the air is rather cold than otherwise. In some other provinces the winter is very severe, though snow is seldom seen. Hail indeed sometimes falls, which resembles snow at a distance. And Mr Bruce mentions an account of snow having once fallen which lasted three days, and was looked upon to be a kind of prodigy. There are frequent and violent thunders, with excessive deluges of rain during one part of the year, and there are likewise violent storms of wind. The missionaries mention a kind of wind named *Senda*, which, according to Gregory, may be seen like a serpent of vast magnitude with its head on the ground, and the body twisted in vast curls up to the skies. This, in all

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p. 102.

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of the mis-
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winds.

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Mr. Bruce's
account of
its divi-
sions.

probability, is no other than that violent species of whirlwind named *Typhon*, frequent in America and other warm countries; and its being visible is owing to the dust which it takes up in its passage.

Modern Ethiopia, or *Abyssinia*, as it is now called, is divided, according to Mr Bruce, into two parts, named *Tigré* and *Ambara*; though this rather denotes a difference in the language than the territory of the people. The most easterly province properly so called is *Mafuah*. It is of considerable length, but no great breadth; running parallel to the Indian Ocean and Red Sea, in a zone of about 40 miles broad, as far as the island *MASSUAH*. The territories of the *Baharnagah* include this province as well as the districts of *Azab* and *Habab*. In the former are mines of fossil salt, which in *Abyssinia* passes current instead of money. For this purpose the mineral is cut into square solid pieces about a foot in length. Here also is a kind of mint from which great profits are derived. The *Habab* is likewise called the land of the *Agasai* or *Shepherds*; who speak the language called *Ceez*, and have had the use of letters from the most early ages. This province was formerly taken by the *Turks*, when the rebellious *Baharnagah* *Isaac* called them to his assistance against the emperor *Menas*. From that time the office fell into disrepute, and the *Baharnagah* at present has much less power than formerly. The province of *Mafuah* is now governed by a *Mahometan* prince or officer called a *naïye*.

Tigré is bounded on the east by the territories of the *Baharnagah*, of which the river *Mareb* is the boundary on the east, and the *Tacazze* on the west. It is about 200 miles long from north to south, and 120 broad from west to east. All the merchandize sent across the Red Sea to *Abyssinia*, or from *Abyssinia* across the Red Sea, must pass through this province, so that the governor has his choice of it as it goes along. Thus the province itself is very wealthy; and as the *Abyssinian* fire-arms are brought from *Arabia*, the governors of *Tigré*, by purchasing quantities of them, may easily render themselves very powerful. No arms of this kind can be sent to any person without his permission; nor can any one buy till the governor has first had an offer.

Sirc was some time ago united to *Tigré*, on account of the misbehaviour of its governor; but was disjoined from it at the time Mr Bruce was in *Abyssinia*, with the consent of *Ras Michael*, who bestowed the government of it upon his son. It is about 25 miles long, and as much in breadth. Its western boundary is the *Tacazze*.

Samen is a very mountainous province lying to the westward of the river *Tacazze*, about 80 miles long, and in some places 50 broad, though in most it is much narrower. It is mostly inhabited by *Jews*.

Begender lies to the north-east of *Tigré*. It is about 180 miles long and 60 broad; bounded by the river *Nile* on the west. It comprehends the mountainous country of *Lafsa*; and there are now several small governments dismembered from it. The inhabitants are fierce and barbarous, but reckoned the best soldiers in *Abyssinia*; and it is said that this province with *Lafsa* can furnish 45,000 horsemen. It abounds with iron mines, which in *Abyssinia* would be very valuable if properly managed. It is also well stored with beautiful cattle. Near the south end it is cut into vast

gullies, seemingly by floods, of which we have no account. This province is reckoned the great barrier against the incursions of the *Galla*; and though they have often endeavoured to make a settlement in it, they have never yet found it practicable. Several of their tribes have been cut off in the attempt.

Next to *Begender* is the province of *Ambara*, in length about 120 miles, and somewhat more than 40 in breadth. It is very mountainous; and the men are reckoned the handsomest in all *Abyssinia*. In this province is the mountain or rock *Geshen*, formerly the residence of the royal family. This province is parallel to *Begender* on the south; being separated from it by the river *Bashilo*. On the west it is bounded by the *Nile*. The river *Geshen* is another boundary.

Walaka lies between the rivers *Geshen* and *Samba*. It is a low unwholesome province, having upper *Shoa* to the southward. It was in this province that the only surviving prince of the family of *Solomon* was preserved after the massacre by *Judith*, formerly mentioned; and on this account great privileges were conferred upon the inhabitants, which in some degree continue to this day. The governor is considered as an ally, rather than a subject, of the emperor of *Abyssinia*; and to preserve his independency, he has allowed the *Galla* to surround his province entirely, yielding them up the territory of *Walaka* above mentioned. Trusting to the valour of his own people, he is under no apprehension of his barbarous neighbours the *Galla*. This province is also remarkable for the monastery of *Debra Libanos*, where the famous *Saint Tecla Haimanout*, the founder of the power of the clergy, was bred.

Gojam is remarkable for having in it the sources of the *Nile*. It is bounded on the north by the high mountains of *Amid* and *Amid*, on the south by the river *Nile*, on the west by another river named *Gulta*, and on the east by the river *Temci*; on the north-east it has the kingdom of *Damot*. It is about 40 miles long from north to south, and somewhat more than 20 in breadth from east to west. It is very populous, but the men are accounted the worst soldiers in *Abyssinia*. There is great plenty of very beautiful cattle.

Beyond the mountains of *Amid* on the east lies the country of the *Agows*; on the west it has *Buré*, *Ubarma*, and the country of the *Gongas*; on the south, those of *Damot* and *Gafat*; and *Dingleber* on the north.

Dembea occupies all the space along the lake of the same name from *Dingleber* below the mountains bounding *Guefque* and *Kuara*. Mr Bruce is of opinion, that the lake has formerly overflowed the whole of it; and the decrease of this lake he brings as an instance of the decrease of large pools throughout the world.

To the south of *Dembea* is the country of *Kuara*, bordering on that of the *Shangalla*, the *Macrobia* of the ancients. The neighbouring countries, inhabited by the pagan savages, produce gold, which is introduced in plenty into this province. None is produced in the province itself, nor indeed does Mr Bruce mention any part of *Abyssinia* where gold is naturally found. In the lower part of this country is a colony of pagan blacks named *Ganjar*; derived, according to our author, from the black slaves who came into the country with the *Arabs* after the invasion of *Mahomet*. These deserting their masters, formed the colony we speak of; but it is now more increased by vagabonds from other parts than by the multiplication of the inhabitants themselves.

Ethiopia. The governor of this country is one of the great officers of state: he has kettle-drums of silver, which he is allowed to beat through the streets of Gondar; a privilege allowed to none but himself. This privilege was conferred upon the first governor by David II. who conquered the country.

The frontier countries of Nara, Ras-el-Feel, Tchelga, &c. are wholly inhabited by Mahometans, and the government of them is usually given to strangers. The country is very hot, unwholesome, and covered with thick woods. The people are fugitives from all nations; but excellent horsemen, making use of no other weapon but the broad sword; with which, however inadequate we might suppose the weapon to be, they will attack the elephant or rhinoceros.

The most distinct idea of the situation of the Abyssinian provinces is to be had from the map which Mr Bruce has given of it in his 5th volume. According to this, the empire is bounded on the south by a vast chain of mountains, extending with very little interruption from 34° to 44° E. Long. and between 8° and 9° N. Lat. In the more prosperous times it extended beyond these southward, particularly into the kingdom of Adel; but the mountains just mentioned are undoubtedly to be reckoned its natural boundaries on this side. On the east and north-east it has the Red Sea, and on the south-east the kingdom of Adel. On the west and north its boundaries are less distinctly marked; having on both these quarters the barbarous kingdom of Senaar, whose limits will no doubt frequently vary according to the fortune of war betwixt the two princes. From Arkeeko, situated near the foot of the Basaltic mountains, in about 15° 30' N. Lat. it extends to near 7° N. Lat. where the mountains of Caffa, the most southerly province of Abyssinia, terminate. Along the coast of the Red Sea lie the territories inhabited by the Hazorta-Shiho, the district of Engana Shiho, and the kingdom of Dancali, including the territory of Azab and the salt-pits already mentioned. To the westward of these are the province or kingdom of Tigre, including the country of the Debass, part of the kingdom of Bali, and that of Darwaro. Still farther west are those of Siré, Lasta, Amhara, the greatest part of Bali, and part of Fatigar, which last reaches beyond the mountains. Proceeding still in the same direction, we come to Tcherkin, Tchelga, Abargale, Salao, Begemder, Shoa, and Ifat; reckoning always from north to south; Tcherkin, for instance, being to the northward of Tchelga, &c. Shoa extends a considerable way to the westward; so that, besides Ifat, it has to the south of it also the kingdoms of Hade and Cambut; the latter extending beyond the southern ridge of mountains. To the westward are Ras-el-Feel, Dembea, Gojam, and Damot; and beyond these are the kingdoms of Dembea, Bizamo, Gooderoo, and Guraque; those of Nare or Enarea and Caffa occupying the south-west corner of the empire.

With regard to the climate of Abyssinia, Mr Bruce does not mention any thing materially different from what has been already said; only he gives a very particular description of the rains which produce the inundation of the Nile; and of which the substance shall be given under that article. We shall therefore close our account of this country with an enumeration of its products, and some detail of the manners and customs of the present inhabitants.

The great difference of climate, owing to the vast extent and variety of elevation in different parts of this empire, is very perceptible in its soil and productions. The mountains in many places are not only barren, but altogether inaccessible, except by those who make it their constant practice to climb amongst them; and even by them they cannot be ascended without great difficulty and danger. The shapes of these mountains, as we have already had occasion to observe, are very strange and fantastical; exceedingly different from those of Europe; some resembling towers and steeples, while others are like a board or slate set up on end; the base being so narrow, and the whole mountain so high and thin, that it seems wonderful how it can stand. In the valleys, however, and flat parts of the country, the soil is excessively fruitful, though in the warmest places grain cannot be brought to perfection. Wine is also made only in one or two places; but the greatest profusion of fruits of all kinds is to be met with every where, as well as many vegetables not to be found in other countries. There is a vast variety of flowers, which adorn the banks of the rivers in such a manner as to make them resemble fine gardens. Among these a species of roses is met with, which grows upon trees, and is much superior in fragrance to those which grow on bushes. Sena, cardamom, ginger, and cotton, are likewise produced here in great quantities. Among the variety of rare plants to be met with in Abyssinia, Mr Bruce particularly describes the following.

1. The papyrus, the ancient material for paper; which our author supposes to have been a native of Ethiopia, and not of Egypt as has been supposed. 2. Balefin, balm, or balsam plant; a tree growing to the height of 14 or 15 feet, and used for fuel along with other trees in the country. It grows on the coast of the Red Sea, among the myrrh trees behind Azab, all the way to Babelmandel. This is the tree producing the balm of Gilead mentioned in Scripture. 3. The fassa, myrrh, and opocalpam trees. These grow likewise along the coast of the Red Sea. The fassa or opocalpam is used in manufactures; and, according to our author, resembles gum *adragant*, probably tragacanth. The tree which produces it grows to a great size, and has a beautiful flower, scarce admitting of description without a drawing. 4. The ergett, a species of the minosa, is of two kinds; one called *ergett y'dimmo*, or the bloody ergett, from the pink colour of its filaments; the other *ergett el krone*, or the horned ergett, with a flower resembling the acacia vera or Egyptian thorn. These were both found on the banks of a river named *Amo*, near the great lake Dembea. 5. Ensete, an herbaceous plant, growing in Narea, in swampy places; but it is supposed to grow equally well in any other part of the empire where there is heat and moisture sufficient. It forms a great part of the vegetable food of the Abyssinians. It produces a kind of figs, but these are not eatable. When used for food, it is to be cut immediately above the small detached roots, or perhaps a foot or two higher, according to the age of the plant. The green is to be stripped from the upper part till it becomes white; and when soft, it affords an excellent food when eaten with milk or butter. 6. Kolquall, a kind of tree, only the lower part of which is woody, the upper part being herbaceous and succulent. The flowers are of a beautiful golden colour, and the fruit turns to a deep crimson; so that the trees

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make a very beautiful appearance. The whole plant is full of a very acrid and caustic milk. 7. Rack is a large tree, growing not only in Abyssinia but in many places of Arabia Felix. Its wood is so hard and bitter, that no worm will touch it; for which reason it is used by the Arabs for constructing their boats. It grows, like the mangrove, among the salt-water of the sea, or about salt springs. 8. Gir-gir, or gese-el-aube; a kind of grafs found about Ras-el-Feel, growing to the height of about three feet four inches. 9. The kantuffia, a very noxious species of thorn, much more troublesome than any with which we are acquainted, and growing to the height of eight or more feet. The flowers have a strong smell like the flower magni-onet. 10. The gaguedi, is a short tree only about nine feet high, a native of Lamalmon. The flowers, which are yellow and very beautiful, turn towards the sun like those of the helianthus. 11. The wanfey, a tree common throughout all Abyssinia; flowers exactly on the first day the rains cease. It grows to the height of 18 or 20 feet; having a thick bark and close heavy wood; the first part of which is white, but the rest of a dark colour. The flowers are of a beautiful white colour; but it does not appear to possess any other remarkable property, though it is held in great estimation by the Abyssinians, and is even worshipped by the Galla. 12. The farek, or Bauhinia acuminata, grows in the country immediately adjacent to the sources of the Nile; being found by Mr Bruce scarce 400 yards distant from the fountain. 13. Kuara, is a beautiful tree, growing in the south and south-west parts of Abyssinia. It has a fruit like a bean, of a red colour, which in the early ages was made use of as a weight for gold and diamonds; and hence Mr Bruce is of opinion that the name of the imaginary weight *carat* is derived. 14. The walkuffa, grows in the hottest parts of Ethiopia. It is a flowering tree, with beautiful white blossoms, which do not appear till towards the middle of January. The flowers have no smell, and are accounted pernicious to bees. The wood is very heavy. 15. The wooginoos, or Brucea antidysenterica, is common throughout the whole empire, but principally on the sides of the valleys. It is a sovereign remedy against the dysentery, a very common and fatal disease in hot countries. Mr Bruce had experimental proof of its antidysenteric virtues. 16. Cusfo, or Bankfia anthelmintica, is a very beautiful and useful tree, being a strong anthelmintic, and used as such by the Abyssinians. Every person there, whether male or female, is troubled with that kind of worm called *ascarides*; a great number of which are evacuated every month, and the evacuation is promoted by an infusion of this plant. While taking this medicine, the patients sequester themselves from all their acquaintance, and keep close at home. It is said, that the want of this medicine in other countries is the reason why the Abyssinians do not go out of their own country; or, if they do, that they are short-lived. 17. Tefi, is a kind of grain sown generally throughout Abyssinia; and constituting the bread commonly made use of by the inhabitants. They have indeed plenty of wheat, and are as skilful in forming it into bread as the Europeans; but this is only made use of by people of the first rank: however, the tefi is sometimes of such an excellent quality, that the bread made from it is held in equal estimation with the finest wheat. From the bread made of this

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grain a fourth liquor called *bouza* is prepared, which is used for common drink like our small beer. A liquor of the same kind, but of inferior quality, is made from barley cakes. Some have been of opinion, that the use of tefi occasions the worms above mentioned; but this is controverted by Mr Bruce. Nook, a plant not to be distinguished from our marigold either in shape, size, or foliage, is also sown very generally over the country, and furnishes all Abyssinia with oil for the kitchen and other uses.

Abyssinia abounds with a vast variety of quadrupeds both wild and tame. Immense numbers of cattle every where present themselves, some of them the most beautiful in the world. Some have monstrous horns, said to be capable of holding 10 quarts each; but this, as our author informs us, is a disease which proves fatal to them. Buffaloes are here met with in great numbers, and are very fierce and untractable; but there are no such animals as carnivorous bulls, which have been said to exist in this and other internal parts of Africa. Antelopes and other wild animals are met with in great numbers in the uncultivated parts; feeding chiefly on the leaves of trees. They abound most of all, however, in those parts which have been once cultivated, but since desolated by the calamities of war; and where wild oats abound in such quantities as to hide them from pursuit. Hyænas, lions, foxes, jackals, wild boars, &c. are also found, as well as the elephant, rhinoceros, camelpard, and others of the larger and more uncommon kinds. Great havoc is made in the cultivated fields by multitudes of baboons, apes, rats, and mice. There is plenty of hares; but these being reckoned unclean, as well as wild boars, are not used as food. The rivers abound with crocodiles and hippopotami, at least the Nile, and those large streams which flow into it: but a great number have water in them only during the rainy season, and these have neither fish nor any animal that feeds upon them.

The number of birds in this country is immense; nor are those of the carnivorous kind at all deficient. Great numbers of eagles, vultures, hawks, and others of that kind, are met with, and come punctually every year after the tropical rains have ceased. They feed at first upon the shell-fish which are met with in great quantities on the edges of the deserts, where they had lived in the salt springs; but, being forced from their natural habitations when these springs were swelled by the rains, are afterwards left to perish on dry land. When these fail, their next resource is from the carcases of the large animals, such as the elephant and rhinoceros, which are killed in the flat country by the hunters. Their next supply is the multitude of rats and field-mice which infest the country after harvest. The vast slaughter of cattle made by the Abyssinian armies, the multitude of persons killed whose bodies are allowed to rot on the field of battle, &c. furnish them also with another resource. These supplies, however, all fail at the beginning of the rainy season, when the hunters and armies return home, and the vast quantity of water which continually overflows the ground renders it impossible for them to find any other food.

There are other birds which feed upon insects, and multitudes which live on grain or seeds of various kinds; all of which are amply supplied by the immense quantity of fruits and berries which grow in Abyssinia, and are ripe at all seasons of the year. A very remarkable.

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Quadrupeds.398.
Birds.

Ethiopia. ing fasting; and after that, about 8 o'clock, he goes to breakfast."

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Method of
anointing
and crown-
ing the
king.

From these and other circumstances we should be apt to imagine that the Abyssinians, instead of becoming more civilized, were daily improving in barbarity. The king is appointed at his election with plain oil of olives; "which (says Mr Bruce) being poured upon the crown of his head, he rubs into his long hair indecently enough with both his hands, pretty much as his soldiers do with theirs when they get access to plenty of butter." In former times, however, matters seem to have been conducted with more decency. Soemins, the greatest monarch that ever sat on the Abyssinian throne, was crowned, after having gained a great victory over the Galla, in a very different manner, and with the ceremonies which we are told were in use among the ancient kings of Tigré. At that time he had with him an army of about 30,000 men; and was besides attended by all the great officers dressed in the gayest manner, as well as by the ladies of the first quality in the empire. The king himself, dressed in crimson damask, with a great chain of gold about his neck, his head bare, and mounted on a horse richly caparisoned, advanced at the head of his nobility, passed the outer court, and came to the paved way before the church. Here he was met by a number of young girls, daughters of the *Umbaras* or supreme judges, together with many noble virgins standing on the right and left of the court. Two of the noblest of these held in their hands a crimson cord of silk, somewhat thicker than common whip-cord, stretched across from one company to another, as if to shut up the road by which the king was approaching the church. When this cord was prepared and drawn tight about breast-high by the girls, the king entered; advancing moderately quick, and showing his skill in horsemanship as he went along. Being stopped by the tension of the string, the damsels asked, Who he was? To this he answered, "I am your king, the king of Ethiopia." But they replied, "You shall not pass; you are not our king." He then retired some paces, and again presented himself. The question was again put, "Who he was?" To which he answered, "I am your king, the king of Israel." But the same reply was still given by the girls. The third time, on being asked, "Who he was?" he answered, "I am your king, the king of Sion;" and drawing his sword, he cut the cord asunder. The damsels then cried out, "It is a truth, you are our king; truly you are the king of Sion." On this they began to sing Hallelujah, and were joined by the whole army and the rest of the king's attendants. Amidst these acclamations the king advanced to the foot of the stair of the church, dismounted, and sat down upon a stone; which, in Mr Bruce's opinion, was plainly an altar of Anubis or the Dog-star. After the king, came a number of priests in proper order. The king was first anointed, then crowned, and accompanied half up the steps by the singing priests. He stopped at a hole made on purpose in one of the steps, where he was fumigated with myrrh, aloes, and cassia: after which divine service was celebrated; and he returned to the camp, where 14 days were spent in feasting and rejoicing.

Ceremonies of this kind are now given over on account of the expence. Our author was informed by Tecla Haimanout, that when he was obliged to retire into Tigré from his enemies, Ras Michael had some

thoughts of having him crowned in contempt of his enemies; but by the most moderate calculation that could be made, it would have cost 20,000 ounces of gold, about 80,000 l. sterling; on which all thoughts of it were laid aside.

With regard to the manners of the Abyssinians, they are represented by Mr Bruce as highly barbarous. Their continual warfare injures them to blood from their infancy; so that even children would not have the least scruple at killing one another or grown up persons if they were able. Many shocking instances of hardness of heart are related by our author in Tecla Haimanout himself, though otherwise an accomplished prince. Their cruelty displays itself abundantly in the punishments inflicted upon criminals, one of which is flaying alive, as has been already related of Woolhecka. Cutting in pieces with a sabre is another; and this is performed, not by executioners, whose employment is reckoned disgraceful as in this country, but by officers and people of quality. So little is this thought of indeed in Gondar, the capital of the empire, that Mr Bruce happening to pass by an officer employed in this work, who had three men to dispatch, the officer called to him to stop till he had killed them all, as he wanted to speak to him upon a matter of consequence. Stoning to death is a capital punishment likewise common in this country; and usually inflicted on Roman Catholics if they happen to be found, or upon other heretics in religion.

It is not to be supposed that people who regard the lives of one another so little, will show much compassion to the brute creation. In this respect, however, the Abyssinians are cruel and savage beyond all people on the face of the earth. There are many instances of people eating raw fish or flesh, and we call them barbarous that do so; but what name shall we give to those who cut off pieces of flesh from animals while still living, and eat it not only raw but still quivering with life! Mr Bruce labours much to prove, that the way of eating not raw, but *living* flesh, was customary among the nations of antiquity: but whatever be in this, he is the only author who mentions it directly; and it is on his single testimony that the fact is established. The Jesuits mentioned in their books, that the Abyssinians eat raw flesh, but not a word of eating it in this manner; and indeed there are some circumstances which he himself relates seemingly very difficult to be reconciled with known and indubitable facts. He informs us, for instance, that when at no great distance from Axum, the capital of Tigré, he fell in with three soldiers "driving a cow. They halted at a brook, threw down the beast, and one of them cut a pretty large collop of flesh from its buttock; after which they drove the cow gently on as before." In another place he tells us, that the flesh was taken from the upper part of the buttock; that the skin was flapped over the wound, fastened with a skewer, and a cataplasm of clay put over all. Now it is known to anatomists, that no piece of flesh can be cut off without destroying a muscle; and that the muscles of the buttocks are subservient to the motion of the legs. The Abyssinians therefore must have been expert anatomists to know how to cut off such muscles as would allow the creature still to go on; and if their repast had been two or three times repeated, it is plainly impossible that the cow could at any rate have stirred a leg. In his

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Manner of
the Abyssinians.

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Their horrid manner of feeding.

Ethiopia. description of their feasts there is more consistency; for there the animal is tied so that it cannot move: after stripping off the skin, the flesh of the buttocks is cut off in solid square pieces, without bones or much effusion of blood; and the prodigious noise the animal makes is a signal for the company to sit down to table. Every man sits between two women, having a long knife in his hand. With this he cuts the flesh, while the motion of its fibres is yet visible, into pieces like dice. These are laid upon pieces of bread made of the grain called *teff*, already mentioned, after being strongly powdered with Cayenne pepper and fossile salt.

Ethiopia. They are then rolled up like as many cartridges; the men open their mouths, stooping and gaping like idiots, while the women cram them so full of these cartridges, that they seem every moment in danger of being choked; and in proportion to the quantity their mouths can hold, and the noise they make in chewing, they are held in estimation by the company. All this time the animal bleeds but little: but when the large arteries are cut and it expires, the flesh becomes tough; and the wretches who have the rest to eat, gnaw it from the bones like dogs!

END OF THE SIXTH VOLUME.

E R R A T A.

- Page 281. col. 1. line penult. For *Stirlingshire*, read *Perthshire*.
 *367. col. 2. line 15. from bot. For *Barbary*, read *Barabra*. The same repeated line 2. from bot.
 424. col. 2. Dele *Cavall's Electricity* on the margin.
 428. col. 1. line 13. from bot. For *a*, read *u*.
 462. col. 2. line 4. from bot. For 74. read 73.
 463. col. 2. last line. For 74. read 73.
 471. col. 2. line 11. from bot. For "fig. 9." read "fig. 8, 9."
 477. col. 1. line 30. For *B*, read *b*.
 478. col. 1. line 35. Dele n^o 2.
 483. col. 1. margin. For Plate CLXXVIII. read Plate CLXXX.
 504. col. 2. line 15. For *I*, read *T*.
 510. col. 1. line 19. For *ABO*, read *ABC*, and dele "fig. 69."
 527. col. 1. line 26. After the word *conductor*, read "fig. 85."
 533. col. 1. line penult. For "fig. 6." read "fig. 4".

DIRECTIONS FOR PLACING THE PLATES OF VOL. VI.

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